

April 5, 1930

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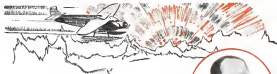
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Employment Manager
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The Liquidometer is not just another tank gauge—it has been proven through many years of actual use. Not a few test units for thousands are in use by over a hundred different industries and the United States Army and Navy. All aircraft type Liquidometers are checked in their operation to the most precise product—the difference is in the size and weight. They have proven their worth on Mail planes, touring ships, two, three and four motored planes, amphibians and blimps.

There are three types of Aircraft Liquidometers: Remote Indicating—Direct Reading Flash mount and Direct Reading Potentiating (illustrated in order mentioned above).

The Remote Indicating type, for use on instrument panel, operates on a patented balanced non-pressure hydraulic system and provides a continuous positive indication. There are no pumps or electrical connections—a positive automatic temperature and barometer correction is part of the instrument.

The Direct Reading Flash Mount can be used on tanks where the end, top or bottom of the tank is exposed to view.

The Direct Reading Potentiating type can be used on road or wing tanks. Both the Direct Reading models are also free from effect of changes in temperature or altitude.

The Engineering Department of the Aircraft Division is in the hands of men who know Aviation. Send us your tank blue-prints and we will return them with Liquidometer drawn in, together with prices. Also specify the type of instrument desired.

First Vice-President
& Chief Engineer

The LIQUIDOMETER CORP.

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LONG ISLAND CITY, N. Y.

CABLE ADDRESS: LIQUIDGAGE, ALL CODES



In Nicaragua CORSAIRS helped make Marine Air History



THE situation the U. S. Marines met in Nicaragua was not just one of revolutionists, bandits, outlaws. It was complicated by the character of the country itself—mountains, jungle-covered, inaccessible, ideal for revolutionists—difficult for the Marines.

Bandits who resist to be driven out without German. The Marines brought with them a squadron of Corsairs, of which Corsair A-7532 was one. And it was not long before

Marine officers learned that their Corsairs were the direct solution of most of their problems.

Corsair A-7532 was shipped directly from the factory to Nicaragua where it was assigned for duty with the VO-7H squadron. In Nicaragua the A-7532 and its sister Corsairs performed a multiplicity of duties—reconnaissance, light bombing; clearing out revolutionist and bandit nests; evacuation of wounded. All this in performance under tropical, unac-

ustomed, difficult war-time conditions.

Only ships of almost of unsurpassable speed-of maneuverability could perform day in and day out under such conditions. How Marine Corsairs performed in Nicaragua is a matter of record.

The Corsair's carrying capacity far best fits the history of Marine aviation. CHANCE VUGHT CORPORATION, Long Island City, New York, Division of United Aircraft & Transport Corporation.

CHANCE VUGHT CORPORATION



PACKARD



RADIAL DIESEL AIRCRAFT ENGINE

PACKARD—the "Master Motor Builders"—announces the first public showing of the Packard-Diesel Aircraft Engine at the All-American Aircraft Show, Detroit, April 5-13.

This revolutionary new engine will be exhibited by Packard in spaces 13-15, Hoover Airway. Several leading aircraft manufacturers will also exhibit planes on which the Packard-Diesel is standard equipment.

The Packard-Diesel Aircraft Engine has successfully met the Department of Commerce requirements for an approved type certificate and has been

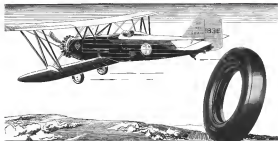
officially rated at 235 H.P. It is now in quantity production and will soon be seen on planes at many flying fields. In view of this, arrangements are rapidly being perfected to provide fuel at all airports.

You are cordially invited to inspect the Packard-Diesel Aircraft Engine—see how easily it starts, how quickly it warms up, how smoothly it operates at all speeds. Flight demonstrations in Packard-owned planes will be available to interested aircraft manufacturers during the week of the Show at the Detroit City Airport.

PACKARD MOTOR CAR COMPANY
DETROIT, MICHIGAN

"The Tyne Company has already arranged fuel supply throughout their international distributing system in the U. S., Canada and Mexico."

Air-Minded for 22 Years



Aviation is no new plaything with the United States Rubber Company. It has been a business with U. S. since 1908. The world's first airplane tire was the first contribution of U. S. engineers to safer, more economical flying. Since that historic development many U. S. contributions to aviation have followed—larger, tougher tires—then today's Web-Cord tires of still stronger but lighter construction. U. S. offers today's aircraft manufacturers a rubber engineering service that is air-minded by experience rather than by fancy. Here you will find competent assistance with any aviation problems in which rubber plays a part.

UNITED STATES RUBBER COMPANY—WORLD'S LARGEST PRODUCER OF RUBBER

U. S. ROYAL AIRPLANE
TIRES



Speeding up airplane production and servicing with Curtis compressed air equipment

FULLY as important as the speed of planes is the speeding up of the building, maintenance and servicing of planes. Executives throughout the aviation industry are rapidly coming to realize that compressed air is one of the most important factors in gaining speed in the work.

Obviously, time, labor and money are saved in very appreciable amounts by compressed air equipment such as—

CURTIS TIMKEN EQUIPPED COMPRESSORS—providing air for spray painting, spraying dope on the wings, tire inflation, cleaning shock absorbers, spray cleaning engines, spraying of grease solvent or paint solvents, air drying of parts dipped in cleaning solutions, blowing out dust, chips, etc., at work benches and drilling presses; air power for opening air lines, riveters, portable drills, sand blasters, pneumatic water systems, etc.

CURTIS AIR HOISTS—Power hoists at little more than the cost of chain blocks. Used with a Curtis 5 Beam Trolley or Crane, they can serve a wide floor area. Used for lifting engines out of haulages, repairing engines, and other parts, and many other purposes where a combination of power, speed and accuracy is a factor of economy. Because there are no electric mechanisms, even unskilled laborers can operate Curtis Hoists without danger of throwing them out of commission.

CURTIS AIR TANKS—Portable tanks for taking air out to a plane wing from the usual source of supply. Stationary tanks for use with compressors used in the shop, also—excellent tanks for mounting on service trucks.



Curtis 5 Beam Trolley and Crane



Curtis Timken Equipped Compressor



Curtis Air Hoist, model 10, and 15 beam



Curtis Portable Air Tank—For taking air out to a plane wing from the usual source of supply.



Write for Curtis Catalogue

CURTIS

St. Louis

The Curtis Pneumatic Machinery Co., was founded in 1892 in St. Louis, Mo. for 40 years. These machines of various sizes, models, and types are used in all kinds of industrial and commercial work. They are designed and built to last, and are guaranteed to give you the best service for the longest time.

204 Kilduff Ave., St. Louis
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Write for Catalogue C-79 and state the product, etc.



Just Read
The LETTER



NEW STANDARD AIRCRAFT CORPORATION
Paterson, New Jersey

REPLY TO THE ABOVE ADDRESS

February 1935, 1935.

Paterson, N.J.
Newark, N.J.
New York, N.Y.

Dear Sirs:

Enclosed are three letters from our customers who have used our products on their airplanes. We are sure that you will find them of great value.

Many of our planes, such as the Titanine, have been used on the coast, and have been found to be of great value in the air.

We wish to have this opportunity to increase your sales and to give you a complete list of our products and prices.

Very truly yours,

The Titanine - a new standard
of the Titanine - a new standard
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W. H. H.



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There Must Be
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WINGS OF CO-VE-CO!

HERE is a plane built exclusively for the transportation of mail and express, fast and light, with wings of Co-Ve-Co Plywood of Portland, Oregon, selected Co-Ve-Co because it was the best. Co-Ve-Co plywood is manufactured without steaming or treating in any way. Lugs out could remain all the strength endowed by nature through centuries of growth, this is the secret of Co-Ve-Co's durability, here is the reason for Co-Ve-Co's strength and sturdiness.

resistance to moisture absorption. . . Aircraft engineers have found that Co-Ve-Co Port Oriented Cedar and Co-Ve-Co Sitka Spruce combine an exceptional lightness with a strength factor found in no other woods, that is why an ever increasing number of new planes are built of Co-Ve-Co. . . You too should investigate Co-Ve-Co plywood. Standard stock stocked for immediate shipment or, if you prefer, Co-Ve-Co can be manufactured to your own specifications and requirements.

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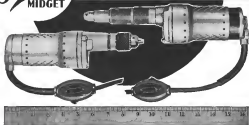
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TRAVEL BY AIR . . . FLY YOUR MAIL AND EXPRESS

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Exceptionally Light In Weight and Speedy

These small electric drills and screw drivers were especially designed for fast, delicate work. Since their introduction, they have rapidly taken the place of small hand operated tools because of their practicability and the many different kinds of work they can be used on.

They fit into the palm of the hand, and being light, are very easily handled. Ideal for Aeroplane, Automobile, Radio, Furniture, Machinery and Electric Appliance manufacturers.

The drills are made in two sizes— $\frac{3}{8}$ " and $\frac{1}{2}$ " in. capacity. Weight is $2\frac{1}{4}$ lbs. Length overall is $9\frac{1}{4}$ in.

The screw drivers are made in three types: one at 1250 R.P.M. for No. 8-32 metal screws; one at 950 R.P.M. for No. 10-24 metal screws; and one at 445 R.P.M. for No. 8 Wood Screws. Weight is 3 lbs. Length overall is $11\frac{1}{4}$ in.

You can try one of these small tools in your own shop for ten days (not of charge). Put it to the test. If its performance doesn't satisfy, return it at our expense. No red tape.

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We're putting Aviation on a money making basis! . . .



With new low prices and a Profit-producing Operating-Dealer plan



GREAT LAKES pioneered the movement to put flying within reach of every-one by lowering the price of its improved 1930 model Sport-Trainee from \$4990.00 to \$3150.00. Now Great Lakes goes even further with a new Operating-Dealer plan that puts Commercial Flying on the same established, profitable basis as any other business.

Great Lakes Operating-Dealers are leaders in Commercial Aviation in their localities. They are keen business men as well as experienced fliers. They operate the leading flying schools, their repair hangars are headquarters to all visiting pilots for maintenance; their other flying activities are varied and profitable. And they lead in ship sales, too... for Great Lakes' outstanding performance, smart appearance

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We'll show you how to get into the money end of flying. We'll show you how we have helped others to organize, to finance, to service, to operate on a profit-making plan that is workable all year round. A great national advertising campaign helps you build your business.

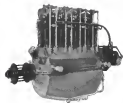
If you would like to establish yourself permanently and profitably in your community with a Great Lakes franchise, write us details of your present operations and a resume of flying activities in your city. . . . Great Lakes Aircraft Corporation, 16930 St. Clair Avenue, Cleveland, Ohio.

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Army and Navy



AIRPORT LIGHTING



In order to get flying on a 24 hour basis airports must be adequately illuminated to make the night operation of planes as safe as it is in the daytime. For this lighting only the best and most reliable equipment should be used.

Crouse-Hinds Company manufactures a complete line of dependable, and efficient airport lighting equipment.

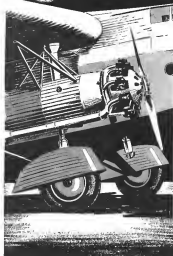
Airport Catalog No. 311 will be sent upon request.

Type DC884 CROUSE-HINDS

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WITHOUT REBOUND -GRÜSS



WHO CUSHIONS YOUR CUSTOMER?

On a surprising number of airplanes not Grüss equipped, there are two kinds of rebound! The first is a rebounding way and juggle from uneven ground or rugged landings. The second, a by-product of the first, is the rebound from your customer that will surely follow.

It is only a matter of landings until your customer becomes hump-conscious and Grüss-wise! Grüss struts, streamlined in our factory, are shipped to you complete with fittings ready for instant installation in your plane. Grüss costs no more, Grüss struts are lighter and require less service, and above all else, Grüss insures smooth landings without rebound.

Why wait until your customer rebounds, dissatisfied, before you too become Grüss-wise? Now is the time to eliminate plane and customer rebound and lessen sales resistance! Change to Grüss!

Grüss struts are demanded by the manufacturers of America's largest land planes. Grüss also manufactures a complete line of amphibious shock absorbers which include a hydraulic retractable gear. Write for details.

**GRÜSS AIR SPRING COMPANY
OF AMERICA, Ltd.**

4126 Everett Blvd., Central City District
Los Angeles, California

THE NEW LeBLOND "66"

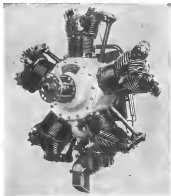
with exclusive LeBlond unit assembly
new power...light weight...low upkeep



The first thing to be said of the new LeBlond "66" is that it possesses exclusive LeBlond unit assembly, first introduced with the LeBlond types "62" and "60" Engines.

Ask any mechanic of LeBlond unit assembly -- how easy it is to inspect a certain part, -- or to remove gear case assembly, or crank shaft assembly for inspection, without towing down the whole engine. He will tell you of these and other vital features of LeBlond unit assembly which provide for vital speed, ease, and economy of servicing.

The new LeBlond "66" is especially adapted to high performance, two and three-plane ships. Cylinders are of steel and aluminum construction offering a considerable saving in engine weight. Bore has been increased and the engine speed raised to give a much higher rating than in the "62".



Approved by the Bureau of Commerce

An exclusive LeBlond feature is the anti-friction rocker bar assembly with skirts for positioning fulcrum of rocker arm with respect to valve stem. With skirt adjustment whenever valves are ground, there is an absolute minimum of wear in the valve guide bushing. The high-efficiency-cooling "poppet-style" cylinder head, originated by LeBlond engineers in the LeBlond "60," is now further refined and improved in the "66".

Quick, powerful, racy, dependable, -- just demonstrate the LeBlond "66" and know for yourself the exhilaration of high performance at its best. The LeBlond Aircraft Engine Corporation, Cincinnati, U. S. A.

LE BLOND

AIRCRAFT ENGINES

Specifications

LeBlond "66" -- Model 6-60

Type	..... 1 cylinder	Model 1 -- Air Cooled
Rated	..... 55 H.P. at 2100 P.M.	
Area	..... 4.22 sq. ft.	
Stroke	..... 3.188 in.	
Total Displacement	..... 295 cu. in.	
Compression Ratio	..... 24 : 1	
Stroke per minute	..... 2500 in.	
Overall Length	..... 35.0 in.	
Weight (Dry Weight)	..... 275 lbs.	

These Men are Responsible for your Training at America's Largest and Finest Air College



Oliver L. Parks, Vice President and General Manager of Parks Air College. Formerly a member of the U. S. House of Representatives, House of Representatives, LeBlond Aircraft Corporation, the Parks Air College, and the LeBlond Aircraft Corporation.



John E. Flork, General Manager of Parks Air College. Formerly a member of the U. S. House of Representatives, House of Representatives, LeBlond Aircraft Corporation, the Parks Air College, and the LeBlond Aircraft Corporation.



James E. Flork, General Manager of Parks Air College. Formerly a member of the U. S. House of Representatives, House of Representatives, LeBlond Aircraft Corporation, the Parks Air College, and the LeBlond Aircraft Corporation.

NO limitation is greater

than the men behind it. When you enroll for training at Parks, you place your future in the hands of men who have secured widespread national leadership in aviation. Men whose names and achievements are known and respected throughout the aviation world.

Parks Air College is a division of the Detroit Aircraft Corporation, a giant industrial organization which includes five of America's finest aircraft factories. The tremendous resources, facilities and prestige of this mammoth concern are behind Parks.

No matter what kind of a training course you are considering, Parks--where all other schools--is best able to give you what you want. Do you

aspire to a private, limited commercial or transport

pilot's license? Come to Parks--here you will find a large staff of the most capable instructors, a great fleet of over 30 training ships of many types, and the most thorough and complete instruction courses imaginable. Come to Parks if you want to become an airplane and engine mechanic--we give you the same quality of instruction as our pilot students receive. All manner are under Mr. Parks' personal supervision. He schemes nothing but the best and most modern methods of training for every student.

Whatever you live, it will pay you to come to Parks for your training. Don't gamble with your future. Your best chance of success lies in commencing your training to this great, time-tested institution. Send coupon for details.

Parks Air College was one of the first to be licensed by the U. S. Department of Commerce as a fully accredited transport school

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DIVISION OF DETROIT AIRCRAFT CORPORATION
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I am interested in:
Pilot's License ☐
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Business Method Working Shop, Garden Flyer Service Station, Buffalo, N. Y.

BRUNNER EQUIPMENT KEEPS THEM IN CONDITION

Compressed air plays an important part in the construction and servicing of aircraft. It saves time and insures better results on such important jobs as engine cleaning, operating pneumatic drills and hammers, tire inflation, greasing, dusting, blowing carbon, testing valves, cleaning shops, parts, etc. For the application of lacquer, special aircraft finishes and wing dope, it provides by far the most efficient method.

Brunner Equipment is built to furnish the dependable service which the aircraft industry demands. Models 854 and 868 are recommended for general hangar service. Special spray painting outfits complete with all necessary accessories are also available. Brunner engineers will cooperate in working out your equipment problems. Catalog No. 15 lists the complete Brunner line including spray guns, engine cleaners, blow guns, etc.

Brunner Equipment is sold by aeronautical and automotive jobbers. It is backed by the oldest and largest manufacturer of automotive air compressors in the world.

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BRUNNER MFG. CO.
UTICA, N. Y.



ENGINE CLEANER
with Brunner No. 17 Gun



SPRAY PAINTING
with Brunner Model 700 Gun



TIRE INFLATOR
with Brunner No. 31 Blow Gun



WING INFLATOR
with Dependable Brunner Air

NOTE: We
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all kinds of
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MADISON
SQUARE
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Staged in the Show Place of the Show World—Madison Square Garden—the New York Aircraft Salon reaches the heart of America's richest market, in the greatest selling month of the year.

The show will open a series of brilliant aeronautical activities in the New York area, with the eyes of the world focused upon the triumphant return of Admiral Richard E. Byrd and the twentieth anniversary of the epochal flight down the Hudson from Albany to New York.

MAKE YOUR PLANS NOW!

Make certain that your organization will be represented in this great aeronautical merchandising event, and emerge to attend the show yourself. Write today for a complete program of the eight eventful days at the New York Aircraft Salon.



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**AERONAUTICAL CHAMBER
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10 EAST 40th ST. NEW YORK

LEADING THE NATION INTO FLIGHT . . .



Announcing **2** NEW**HAMILTON STANDARD PROPELLERS**

for 60 to 115 H.P. engines



This new Hamilton Standard "Sport Junior" light alloy propeller has been designed for engines of 60 to 90 H.P. It has a maximum weight of 17 pounds and a maximum diameter of 36 inches.

This "Sport Senior" is a new Hamilton Standard propeller designed for engines of 90 to 115 H.P. It weighs only 17 pounds and is 36 inches in diameter.

Two important additions have just been made to the Hamilton Standard line of metal propellers.

The "Sport Junior," designed for engines ranging from 60 to 90 H.P., and the "Sport Senior" for engines developing from 90 to 115 H.P. Thanks to quantity production, prices on these new models are very moderate.

Hamilton Standard light alloy propellers have demonstrated unequalled superiority in efficiency over those made of other materials. A simple calculation, based on the cost per horsepower of an aircraft engine, will show how this improvement in performance is enough to justify the cost of the light alloy propeller. Another simple calculation, based on the cost of fuel, will show that the economy resulting in a relatively short time, from the superior efficiency of Hamilton Standard Propellers, will also justify the cost of the light alloy propeller. Hamilton Standard Propellers will outlive many sets of propellers made of other materials. This factor of itself

will cover the cost of the Hamilton Standard Propeller.

Any one of these three striking economic advantages is enough to dictate the use of light alloy propellers. All three of them are contained in Hamilton Standard Propellers. In addition, the fact that two blades disintegrated when Hamilton Standard Propellers are used, and that damage to blades can be readily repaired, are important practical advantages. It is for these reasons that Hamilton Standard Propellers are so widely used in the commercial and military fields at home and abroad.

The addition of these two lightweight, low-priced propellers to the Hamilton Standard line makes these advantages available to the pilots of Sport Planes. The "Sport Junior," at about 33 pounds, and the "Sport Senior," at about 27 pounds, are available for prompt delivery. Correspondence is invited bearing upon these new models, and upon any other question or problem concerning aircraft propellers.

HAMILTON STANDARD PROPELLER CORPORATION
PITTSBURGH PENNSYLVANIA



DIVISION OF UNITED AIRCRAFT
AND TURBOJET CORPORATION

Voltage Regulation

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LEECE-NEVILLE

Applied to

**Engine Driven Generators
For Airplanes**

TYPE	VOLTS	AMPERES	R.P.M.
B-1	12	25	2000-3000
C-1	15	50	2000-3000
G-1	15	15	2250-4000
D-1	15	25	2250-4000
E-3	15	50	2250-4000

On Display at

ALL AMERICAN AIRCRAFT SHOW

April 5-13th

MUNICIPAL AIRPORT

Detroit

Manufactured by

The Leece-Neville Company, Cleveland, Ohio

STROMBERG
CARBURETORS

are used as standard equipment

... by ...

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STROMBERG

growing with aviation

Years ago when aviation was in the experimental stage Stromberg was experimenting, too, with an aircraft carburetor. One that would be dependable, light. That would supply the proper fuel mixture to the engine at all speeds, in all positions—efficiently and economically.

Such a carburetor was developed. The difficulties of propeller blast and upside down flying were overcome. A dependable, durable,

economical carburetor was designed and built.

The aviation world quickly recognized the remarkably fine performance of Stromberg carburetors. With the result that over 90% of American aircraft flying today is Stromberg equipped. And as aviation grows, and new planes and new engines are developed—invariably built to Stromberg for the solution of their carbureting problems.

STROMBERG MOTOR DEVICES COMPANY

(Division of Republic Aviation Corporation)

32-62 East Twenty-fifth Street

Chicago, Illinois



THE OLDEST AMERICAN AERONAUTICAL MAGAZINE

VOLUME 114—1930 PUBLISHED BY THE AVIATION PUBLISHING CO.

LLOYD AND I. W. BARNER, Editors

MAY 1930 . . . April 5, 1930 . . . Volume 114

Detroit . . . and Salesmanship

IN THE HOLDING of aircraft shows there are two distinct purposes, and when two times of first rank importance are scheduled but a few weeks and a few hundred miles apart they naturally assume distinct aspects. A display of aircraft reveals the state attained by the art of design, and offers the engineers of the industry the opportunity of making concentrated observations of the latest trends of their dreams. Of more importance to the stockholder, however, if not of greater importance for the student of aeronautical science, is the commercial function of the display. An aircraft show is a show in the accepted sense of the term, but it is also a market-place. It takes the measure of public interest and of prospective public demand for the products arrayed upon the floor.

Most of the essential activities of 1930 were offered to the public gaze in February, although some of our magazine have been laid back for their first display at the current show. The national importance of the Detroit gathering is not, however, primarily in the recognition that it will exert, but in the opportunity that it offers, the best so far presented, for gauging the sales prospects of 1930. We have recognized the necessity of finding a new public, and meeting them in a new spirit. The past few weeks have given some clues to be gathered up and interpreted when the distributors and manufacturers come together at Detroit, to the point in which our new potential customers are going to meet us.

This week's show is ably planned for the purpose it covers when the season of intensive activity in the northern states has continued just long enough to provide an index of the expert and the nature of the business existing among possible rural customers. It comes in a city recognized as one of the leaders in public enthusiasm for aviation and all its works. It comes within all its perfections in a building ingeniously connected with a

flying field, and it is but a few steps from the aviation air floor to the demonstration of the same machines in the air. That may be a dorsal blow to the taxicab business, but it is a welcome innovation from the point of view of the seriously interested dealer, operator and would-be private purchaser who will be on hand.

The proximity of the flying field, and the prospect that it will be used to some extent under the best of its capacity, creates a very grave problem of traffic regulation. The management have prepared an exceptionally conservative set of flying rules. As the minimum consideration of safety, they must be followed. They should be enforced with stainless vigor if necessary, but an enforcement ought to be ruled for. Ordinary good sense on the part of the pilots should ensure the most careful and minutely detailed observance of every field and air regulation.

Detroit's offering should be more a test and a demonstration of emotion than a "show". Whether at Detroit or anywhere else, however, will supplies sell themselves. Merchandising is as low as art that design or production, and the student of aircraft technology gains much from the experience profitably and slowly assimilated in his own field and from the presidents of other related industries.

Because of the infamous relationship between the Detroit Exhibition and the problem of selling, we have devoted much attention to the cause of AVIATION to a survey of the merchandising side of the industry as it stands today. The topic is one that must be of interest to engineers if the industry is to progress in public favor. No one concerned with the commercial art, from the worker in a wood turned to the pilot or an air line, can be indifferent to the subject of selling. The factors for all of us largely upon the success with which the problems of principle and technique here discussed are solved in practice.

And Now LET'S GET DOWN TO Work



William B. Stout, will persist

By WILLIAM B. STOUT

*President, Stout Air Lines Consulting Engineers
Airplane Division Ford Motor Company*

ILLUSTRATIONS BY THE AUTHOR

RECENTLY some seven hundred millions of dollars have been poured into aviation. Many factories on every land are attempting to get into production on this type of thing. Schools here, there and everywhere are striving to graduate pilots as prospects for coming production. Aviation publicity and the public's belief in flying has gone forward with great strides and everything concerned with aviation has been booming.

But, the future of aircraft industry is still the responsibility of the engineer. Money alone never did and never will create anything. There is no use of going into production in quantities on a thing which the public does not want in the first place.

There is small sense in building a lot of planes with the market limited to those few who now know how to fly. Flying is too expensive to learn to attract the general public as yet. A lot of things must be done in the airplane before the private-owner industry is here and these things are up to the engineer to solve and not to the banker or the salesman or the production manager.

No one, at yet, has built the private-owner plane, and by that I mean a plane that will fit the public—not just the pilot market.

The public is "The man on the street" who believes in criticism, who wants an airplane for his own use, whose finances and intelligence are average and who is just as ambitious as the millionaire. It is just as foolish to say that the plane will be only for the use of wealthy, as it was when the Dodge Brothers made that statement to Henry Ford about automobiles. The automobile has created enough wealth so that now the public can enjoy motor transportation. Aviation will produce more wealth, but, nevertheless, present-day planes must fit present-day economics.

This man on the street is not versed in aviation matters that he has a "bug" to fly. He usually looks on terms as air pockets, till after, air-mindedness without really knowing what they mean, if they really do mean anything. If this man ever flies, he cannot afford to go away to school for six weeks and spend \$5,000 or even \$1,000 to learn how to fly. He will expect to go on a Friday afternoon and fly his plane back home the following Monday morning.

You may laugh at my statement, if you will, you in the industry, but until you do this and build a plane that is safe enough for him to fly home as, you will not have

the industry for which you are looking. We can eventually make a plane safe-enough so that a man can solo in 5 hours and fly home in 10, with the Department of Commerce's entire sanction. As we engineers meet our obligation, we can rest assured that the Government will remove any restrictions to advancement.

THE DANGER of our present situation is too much money. This money is looking for dividends rather than progress, whereas the industry is looking for progress. The money wants production and sales. The industry wants better airplanes, engines, instruments, etc. The man with too much money will make his experiments on too large a scale, a man with only \$10,000 to work with will experiment as cheaply as he can to conserve as much as he can and his mistakes will be small. The man with a million will make just as many mistakes but his will be on a larger scale. For this reason, the big firms can do less thorough test analysis would seem otherwise. We can take it for granted that the new things in the industry will come from small experimenters rather than factories and from enthusiasts rather than extreme technicians. So, the small experimenter is a hero in a back lot can take heart as having more chance of solving this thing than the millionaire in a million dollar laboratory. The new industry coming includes not only airplane and engine design and building, but sales, servicing, public advertising, repair, operation and whatnot. We all have wondered what will be the first step and how this thing



can be carried on, but we have made small analysis of the conditions.

To date, we have revised the original Wright airplane by better engines and better aerodynamics and higher factors of safety, but we have not changed the materials nor the fundamentals. We have built no airplanes since the Wright as efficient per horsepower as was the Wright airplane. We are still building like a letter are cheaper to build. We build square wings with ribs. We build fuselages and cover them with cloth for the same reason. Isn't it time we realized that at this stage of development, the great cost is not production, but sales. It is much cheaper to add a thousand dollars to the first cost of an airplane if you can save a thousand dollars in sales resistance, for you build up your volume so much quicker. There is only one way to market an airplane cheap and that is by not building cheap airplanes. We must first solve the problem of the plane and then make this good airplane cheap by quantity of production. There is no other way. Those spending their time trying to make a cheap airplane have been and will be disappointed in sales, for the public does not want merely a cheap airplane. It wants the safest possible airplane at a cheap price.

In the new airplane design, therefore, sales is the first step to have a small even ahead of performance itself.

*At the present time every member of the aircraft industry is seeking a solution to the problem of . . . What should we do, and how are we going to do it? If all expressions of opinion regarding that problem were placed end to end they would reach from here to there and back again. *This article contains the opinions*

*of Mr. Stout, who, of course, needs no introduction to our readers. *Whatever Mr. Stout writes is always worth reading, and digesting thoroughly. His views should prove of particular interest to engineers and manufacturers and other members of the aircraft industry who are struggling with the same problem*

- ▶ The airplane business is still in the hands of the engineer.
- ▶ This article is intended to stir up discussion.
- ▶ It probably will not fit in with the ideas of others and most manufacturers will not agree with me.
- ▶ These chief facts will be that it can't be done.
- ▶ The pilots will be the last to see it.
- ▶ The ideas do not conform to a business way to helping already present inventions.
- ▶ They will find considerable research and the spending of money before we ever to the solution.
- ▶ Money is about all that we have in aviation as yet.
- ▶ Let's forget the money for a while. Let the investment builders return to Tulsa Beach with its casinos and let us—landlord for his department—get down to solving airplane problems instead of allowing the banking business to bully us.
- ▶ Money never created anything yet!
- ▶ What we need now is to look around for zinc houses.
- ▶ Forget what has been and what is. Let's analyze what must be before we have a real aviation business. They let's do it, and behold!—Aviation!

The general public has an idea from cheap motor car methods that sales are handled on the public's own terms; that it does not give—literally, hand and passing—with buyers, giving away the product free on literary release or in theater lobbies to get rid of products. It is history, however, that the great production of goods is of the best goods a fair sales resistance is cut down by obvious quality—quality of materials, quality of workmanship, quality of performance and in most cases, primarily of appearance. In airplane work, we cannot force on to the public something that it does not want. We can not send a high pressure salesman around to the public's back door to show a machine into the kitchen while the assistant rings the front door bell to get the help-of-the-house out on the porch until the audience is delivered. These tactics have worked in the past with crowded numbers of cheap products, but these days are over and would not fit our problem anyway.

Factors that have made the cheap motor car method of sales and distribution of airplanes in pop meetings of dealers and public concentration and enthusiasm have left this type of plane sales under fire. Airplane are a new product and something new is required to move them. The method of sales must visualize something new or the prospect will not be convinced.

Here is a fundamental: When you read an advertisement, the eye translates the sense of the reading to the ear which translates the sense or nonsense of the ad, and reads it back again as a visualized picture to the eye. The words which carries the picture directly to the brain. Talk or printed word, therefore, has to be translated in one's head and, therefore, loses force and authority. If the eye can be immediately sold on a product without recourse to word or printed page, the mental device is immediate and fast.

We have already developed in civilization, what I have called "The Science of Eye-Appeal." This term is used because the ordinary word, to visualize the scene, pictures to our only palatium on the wall of a museum or institute, or decoration in a museum's hall—Jacks, squares, rectangles, bands of front and back—planned to delight the on-looker and sell an object to him. What I am trying to visualize in this sense science applied to painting "Eye-appeal" into our product. This science is ordinarily known as "Art."

The rules of arrangement of line, color, form, composition, perspective, contrast, tone value, are just as important as the rules of mathematics as engineers to glorify ship off the end of a slide rule. There is more grace work than in the mathematical branch of our engineering. If we want to build a theater, or build our art around practical facts of an arrangement and dimensions, light location, pitch of the sight and height of sight, color and of lighting, location of specific scenery elements and the like. We want to give the customer at the theater the greatest comfort possible both of body and eye and all of his mind can be concentrated on the play.

Details are useless, decorative, random, excessive does not have to be. The reason that one can see a theater, stand a great deal of decoration for an hour without being tired.

If we want to build a building for different psychological effect, we can arrange our art in lines, form, color to fit almost any requirement. If we want to use a car for speed, we give him a car give him a lot of high velocity in the building, the distance, maximum

able seats and a stage at the side instead of the center so that his neck will be twisted—and a nose wrecker to rest his eye.

Now, if we cannot use some of the science which is so well developed in other sales lines and apply some of its principles in making our product look like something the public wants to buy.

The hardest thing to design into any airplane is that feature which makes a person stand in front of the product and say, "I want that." This eye-appeal is what makes an Chevrolet car worth \$5,000 when the one next to it at another manufacturer and the same amount of cost can be purchased for \$10,000. Give a hint of this eye-appeal into any airplane, however, and it can even be an airplane that has the appearance push on to it, and develop with it, even though the airplane may be 50 to 100 above and ten fold. We know enough about the engineering to know that we can get that into the design, but we have thoroughly neglected to date the attention to build something to sell the eye.

Once the eye is sold, however, we must see to it that the product in demonstration more than lives up to its appearance. If we are going to get this new public, we must have new performance both in safety, speed, climb, take-off, landing and maintenance. It cannot just be another layer of any hush-on-the-airframe design.

In striving for this, however, there are three things we must keep in mind. First—*What safety demands.* Second—*What the public demands.* Third—*What performance requires.*

IN THE FIRST instance, safety it needs no argument that structure must be strong. No matter how good an airplane may be aerodynamically, if the wings come off when it goes up into the air, it is not an airplane. Strength even stronger than our present Department of Commerce safety requirements must be built into planes in order to keep down the cost of maintenance.

After this basic necessity of structure comes vision. Vision in present-day planes is always a source of real trouble to a pilot on his first flight. He cannot understand the planes as he sees them, neither can he see other obstacles directly in front of the pilot, entirely obscuring front view of the field in landing. If one had to drive an automobile by watching the side of the road, he would quickly change the design.

Many designs with us on the importance of this, but as airplanes get more and more into the air in numbers, vision will become more and more of basic importance. It will be necessary, also that this vision be standard for all planes. One of the greatest dangers now of flying around airports is of collisions, where one plane can go up and another where the other plane can go down and not see. The plane below is likely to show into the plane above without seeing it, or the plane above is likely to hit on the plane below without seeing it. It is my belief that a direct forward vision will soon be a requirement of the public as all airplanes, the same type of vision that they now have is an annoyance or glider. One can take a glider, where the pilot sits out in front with nothing ahead of him, coast off a hill and make a respectable landing the first time he ever tries. The vision is what he is accustomed to and as he approaches the ground he naturally falls back on the stick at the proper time. If we could eliminate the present engine in the power of the pilot, drive him clear of the engine at a distance from the ground in which he is accustomed to an automobile, it is my belief he could cut at least two

hours from the training period of the average student pilot on landing. As soon as the air gets full of planes this vision will be necessary.

The next thing which safety demands is controllability. This is really different than mere stability. This has been pointed out as the difference between a bicycle and a bicycle. The bicycle has stability but will not go where you want to steer it unless the ground is level. The bicycle has uncontrollability and once in motion you can make it go wherever you want, side hill or not. It is perfectly easy to make a stable airplane, as we know, but it would follow every good road. What we want is a plane which will go down where we sit it down, whether the wind be from the side or any other direction.

Another item of controllability is, in a stall. Coming into land in a critical moment in aviation. If one is overshooting his field through misjudgment, or otherwise, the pilot either must slide or stall the plane in. The latter is the better and safer way, provided the wing curve is such that the lift does not bubble out suddenly as in the this winged German and American Military type. The wing curve of lift should show a flat spot at from 16 deg. to 20 deg. or the equivalent, so that there is a wide angle of attack available to the pilot at a stall and particularly to the student pilot, to take care of landing judgment and lack of experience. This gives a large margin of safety in getting the feel of the plane as he comes in.

When he looks out for landing he should know that support will not suddenly leave him and that when he stalls he will have enough controllability in the wheels to keep from going into a spin, no matter what sort of wind, or unexpected happening



any wind. This type of wing curve should save another hour in the length of time before solo for the average student, where one is landing has only to fly this particular movement, as in the case of a propeller or engine.

Now, if we can fit to this machine a super-loading gear, capable of taking shocks equivalent to a flat spot landing, we can still further reduce the student time. Very recently with a new type landing gear and Movac tires, we installed a 10-meter (over 25 ft. to an angle of about 45 deg. with no more shock to the plane than a normal rough landing with the old type wheel and gear. With such a firmest a student pilot could safely come in and land, possibly needing not three or four feet from the ground and land with it gets accuracy, equivalent to the better and better. As soon as he can make easy forward landings from normal height, he can solo without danger.

It is my opinion that safety also demands closed cabins, if we are to do all four several things. Like David, no

man is at his best in a far level flying suit, helmet, mitts, goggles, goggles, etc. Not only can he fly better in the closed box, the cabin itself and a proper heater will warm him and after better performance than the weight of the flying suit, etc.

Now we come to what the public will demand. Whether they realize it or not, appearance is the first sales factor. If the plane does not look safe to them, they would rather sacrifice else try it on first. This appearance, so far has harmed our product type planes, even though the extra expense is added. It is hardly possible that the out-rigger type of plane will impress the purchaser as a personal type. If we can make a real first plane, allowing a two-stage, appearance might be had.

NATURALLY the public knows the fact; this means tells it visually. The public does not trust tandem two-stage planes carrying two are more than it would buy a two-stage automobile back the way over. If a young man is flying out with a young lady he does not want her sitting over his back where he cannot talk, or cannot point out the things of interest along the way and it is probably denied of any touchability on the trip. The public will demand side-to-side seating with some provision arranged, however, so that the passenger in an emergency cannot grab the arm of the pilot and be a powerful cause of disaster.

Probably lost on the fact which the public will demand is reputation for safety. I would use the word safety, but as yet the public does not want other safety carries of it in an airplane (not, in fact, does the engineer), but a type must have a good reputation before the sales resistance can be overcome, so that the public will have a basis of real belief in their security.

Finally we come to those things that performance demands. First is light weight to both plane and the engine. I mean by this light weight per square foot of wing and light weight per horsepower of engine. For this present concern, plane with our present performance we should have at least 50 lb. per passenger and for a private owner plane a wing load of not over 10 lb. per sq. ft.

Second to light weight, comes low resistance, or resistance possible resistance. The private owner pilot of the very new future will demand of accuracy have to have a cruising speed of at least 100 m.p.h. If we give this plane the smooth curves necessary for high speed, hold up the landing gear, envelope the engine, etc., then we have made a "boxer" which may very easily cost a beginner some difficulties. The overhauling his landings. There should be arranged, therefore, for such a type of plane some kind of parasite resistance to be extended from the plane to hold the lift-drag ratio and help him to stall in front any angles over three in small spaces.

Finally the three fundamentals that I want to leave particularly as affecting sales at the present time are:

First: *Appearance*—We are not giving the public what it wants in design.

Second: *Cost*—We have been trying to build cheap planes, instead of striving to make the best possible plane cheaply.

Third: *Performance*—Such as to cut out the major risks and true requirements of the student pilot, before the purchaser can fly his own plane home.

WHERE IS MY *Wandering* Market TODAY?



A well known private plane owner
and his machine and his travel aid

SPEAKING GENERALLY, the American aeronautical industry is divided into two classes of members, the optimists and the pessimists. However, between these two extremes is another group, a very small group, composed of people who are keeping their eyes on the bill and are neither optimistic nor pessimistic regarding the results of their efforts. It is that group, and the ones who fall in line with them, that our children will have to thank for glancing aeronomics on a profit paying basis.

When Lindbergh went to Paris the aircraft industry in this country became a group of racing agitators. And then in the course of the next three years the Order of Aeronautical Pessimists and Kill Toys was inaugurated. The sharp of 1929 and many of them down out of control and today they go to shows and other aero functions with faces a mile long, and nothing but sad words for the future. The ones who retained their membership in the Society of Aero Optimists and Hot Air Artists are still rising as of now, if not through the force of habit, then because they fear that the public will drop its interest in aviation entirely.

The third group, which might be termed the Hard Boiled, Lead Headed Aero Business League, is neither long of face nor rising. It is sitting on its business collectively and individually, and endeavoring to apply Lindbergh's effort to the task of making money.

And that is just why we are all in aeronautics . . . so make money. We may be in it because it's our first love . . . we may be in it because it's an attractive hobby . . . or we may be in it because of necessity. But everyone of us is in it to make money, if we can. And so, the optimists talk in terms of profits and work in terms of niches and dimes; the pessimists groan only in terms of bills and red ink; and the hard headed, lead headed ones think and work in terms of future progress.

The problem, then, is what is to be done, and how should it be done. For the sake of clarity and consistency

let us regard the situation as the Hard Boiled Lead Headed Aero Business League undoubtedly views it.

We have developed a new and wonderful means of transportation. Regardless of all other comparisons that might be made, it is at least the fastest mode of commercial or private transportation in the world today. In our opinion, it is safe, it is efficient, and it is adaptable to the daily life of the man in the street. That man in the street, however, does not agree with all of our views. He questions at the performance of the airplane. He appreciates its capabilities. But he and other members of the majority of men in the street do not consider it necessary to their daily life in either a business or pleasure way.

Why? . . . that is the problem . . . the question that must be answered satisfactorily.

Is it price? Some say yes, others say no. Airlines have slashed rates to a point where they equal railroad rates, and traffic has increased enormously. Perhaps it is price, after all. Yet on the other hand, some street operators report that even with reduced rates only about fifteen per cent of traffic is repeat business.

Some manufacturers have cut prices on their products. Cut them below any chance of profit in the present market. They believe that quantity sold will make up the difference eventually. Perhaps so . . . but when? And what about the time in between?

We often hear comparisons made between the price of airplanes and the price of automobiles. And with much emphasis upon the fact that airplane prices are considerably more. Is there any logical reason why they should be less? Is the purchaser getting more for his money in both quality workmanship and performance? When the man in the street changed from the horse and buggy to the motor car he paid more as initial cost, and he paid more for maintenance. In the airplane he secures an even better method of transportation for pleasure or business. Why then should he expect to pay less?

Naturally it follows that quantity production and sales will reduce manufacturing costs so that P.O.B. prices will also be reduced. But why insist that the price should be at least equal to, if not less than, the price of the method of transportation that supplanted the Old Gray Horse? Certainly there is a difference in price between a roadster and a motor boat and another department of that industry is suffering because the public does not appreciate the difference in product utility for money received.

Therefore, it would seem very logical to inspect those facts upon the airplane properly. Consider him of the superior workmanship, convince him of the superior per-

formance and convince him of the increased value and safety for money received.

All of which sounds very nice until one asks the question . . . who is the prospect, and where is he?

If we knew, we would gladly send name, address and telephone number to all reputable aircraft manufacturers. That however, is the task that looms ahead. The point is none though, is that although quantity production and sales will reduce prices, we must face the fact that we have not yet quantity production and sales at the present time. What are we going to do about it? The answer would seem to be that if it must be a case of hand-picked selling, then hand-picked selling it is. If we must sell our product for five thousand dollars in order to make one, then let's go after people with five thousand dollars.

THERE are plenty of people in this country who can afford what the modern airplane costs. The trouble is that we have made only a half-hearted effort to search them out. Let's put a little business into this aviation idea. If the market appears to be saturated for our product, let's do some market research and some market analysis. How many people in Texas can afford the price we ask? How many have a need for what our product will give them, etc., etc? How many in Maine, New York, Kansas, California, and the rest of the 48 states? We do not know. Well then let's find out. Let's determine the market in figures . . . accurate ones, not guess work. If we can't do it, then let's employ someone who can. If we are a big machine then let's set up a research department and acquire all that valuable information. Then when we get it, let's go out and comb to the last prospect. But the idea is, let's search and develop the market that can afford our product and the market whose needs are best filled by our product. If the Jones Company is selling the less wealthy man next door a cheaper product let him go ahead with it. Let's seek to our market . . . in short, stick to our business.

Do we need dealers and distributors? Make yes,



A Fokker Aero-Cyclotron equipped for cross-country



A bi-engine Aero-Cyclotron for the Rural Typewriter Co.

By R. SIDNEY BOWEN, JR.
Assistant Editor of AVIATION

It is unfortunately true that the industry has made many merchandising mistakes since Lindbergh's flight. Some of them were unavoidable, others were not. However, each mistake taught its own particular lesson, and out of all that will come future progress for those who keep hammering. The industry is not up against a brick wall, neither is it hitting an all ice. ¶ This article which deals with past mistakes, and their effect, does not attempt to offer definite solutions of the many problems that confront the industry. It merely suggests, by comparison with what has gone before, methods of attack which in time, might lead to possible solutions.

maybe not! But at any rate let's not get the idea that a dealer and distributor organization loaded up with our products means that we are building up sales volume. It doesn't! It merely means that we are getting pieces out of our factory. Selling only 100 pieces to satisfied customers means more to the future of our business than 1000 pieces in the hands of distributors and dealers.

And, as to our product. We honestly believe that it is a very fine. It probably is, but have we really and truly tried to convince the public of its quality, and more than that, of its utility? We've made all sorts of world records, we've made all sorts of track flights, and we've made the public go out in the rain to buy a paper and read of the wonderful things that our product has done. And now we tell that public that it should ride in our product, that it should buy one. The public perhaps considers for the moment, and then one of our products spins into the ground and there is no ride. Why? Because we've been hammering on one thing, and not on our utility.

And when we come right down to it, have most of us really made any attempt to give the man in the street an airplane he wants? We have not! As a matter of fact

to the requirements of those who can afford to pay for the fastest and most luxurious forms of transportation. Outstanding exceptions have been the de luxe craft developed by Sikorsky and Loening, the executive models planned on the market by Lockheed, Ryan and some others, and the custom built air cruisers now being marketed by the Rich Company. It is this latter type of plane that will do the Rich company's real business. The great majority of profits outside of the more heavily exploited fields, provided that an efficient sales plan is coupled with the manufacture of such a plane. For the benefit of aviation in general we feel that the development of nonexclusive designs of the quality type, ranging from the mass-produced to the luxury type, is the business of the country when it is really interested in the business of the country and not in business and pleasure flying, will do more than any other sort of miscellaneous flying to add aviation to the general public.

Aircraft will surely cover all the phases of transportation already engaged in by surface craft, either land or water. Just as the freight boat, train, or auto truck has been widely used as a freight carrier, so we are finding increasing application for small freight carriers for handling the milk, express, and many types of commodities. We have motor and bus planes, and planes that are transport auto buses, and automobile taxis, heated passenger trains and short haul automobiles; ocean and coast-wise liners and cross-channel ferries. The one phase of aerial activity which has been best developed is that which would fall in the same class with the cabin express carrier on the water and the Pullman, 7-15, 7-16, 7-17, 7-18, 7-19, 7-20, 7-21, 7-22, 7-23, 7-24, 7-25, 7-26, 7-27, 7-28, 7-29, 7-30, 7-31, 7-32, 7-33, 7-34, 7-35, 7-36, 7-37, 7-38, 7-39, 7-40, 7-41, 7-42, 7-43, 7-44, 7-45, 7-46, 7-47, 7-48, 7-49, 7-50, 7-51, 7-52, 7-53, 7-54, 7-55, 7-56, 7-57, 7-58, 7-59, 7-60, 7-61, 7-62, 7-63, 7-64, 7-65, 7-66, 7-67, 7-68, 7-69, 7-70, 7-71, 7-72, 7-73, 7-74, 7-75, 7-76, 7-77, 7-78, 7-79, 7-80, 7-81, 7-82, 7-83, 7-84, 7-85, 7-86, 7-87, 7-88, 7-89, 7-90, 7-91, 7-92, 7-93, 7-94, 7-95, 7-96, 7-97, 7-98, 7-99, 7-100, 7-101, 7-102, 7-103, 7-104, 7-105, 7-106, 7-107, 7-108, 7-109, 7-110, 7-111, 7-112, 7-113, 7-114, 7-115, 7-116, 7-117, 7-118, 7-119, 7-120, 7-121, 7-122, 7-123, 7-124, 7-125, 7-126, 7-127, 7-128, 7-129, 7-130, 7-131, 7-132, 7-133, 7-134, 7-135, 7-136, 7-137, 7-138, 7-139, 7-140, 7-141, 7-142, 7-143, 7-144, 7-145, 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7-718, 7-719, 7-720, 7-721, 7-722, 7-723, 7-724, 7-725, 7-726, 7-727, 7-728, 7-729, 7-730, 7-731, 7-732, 7-733, 7-734, 7-735, 7-736, 7-737, 7-738, 7-739, 7-740, 7-741, 7-742, 7-743, 7-744, 7-745, 7-746, 7-747, 7-748, 7-749, 7-750, 7-751, 7-752, 7-753, 7-754, 7-755, 7-756, 7-757, 7-758, 7-759, 7-760, 7-761, 7-762, 7-763, 7-764, 7-765, 7-766, 7-767, 7-768, 7-769, 7-770, 7-771, 7-772, 7-773, 7-774, 7-775, 7-776, 7-777, 7-778, 7-779, 7-780, 7-781, 7-782, 7-783, 7-784, 7-785, 7-786, 7-787, 7-788, 7-789, 7-790, 7-791, 7-792, 7-793, 7-794, 7-795, 7-796, 7-797, 7-798, 7-799, 7-800, 7-801, 7-802, 7-803, 7-804, 7-805, 7-806, 7-807, 7-808, 7-809, 7-810, 7-811, 7-812, 7-813, 7-814, 7-815, 7-816, 7-817, 7-818, 7-819, 7-820, 7-821, 7-822, 7-823, 7-824, 7-825, 7-826, 7-827, 7-828, 7-829, 7-830, 7-831, 7-832, 7-833, 7-834, 7-835, 7-836, 7-837, 7-838, 7-839, 7-840, 7-841, 7-842, 7-843, 7-844, 7-845, 7-846, 7-847, 7-848, 7-849, 7-850, 7-851, 7-852, 7-853, 7-854, 7-855, 7-856, 7-857, 7-858, 7-859, 7-860, 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7-1003, 7-1004, 7-1005, 7-1006, 7-1007, 7-1008, 7-1009, 7-1010, 7-1011, 7-1012, 7-1013, 7-1014, 7-1015, 7-1016, 7-1017, 7-1018, 7-1019, 7-1020, 7-1021, 7-1022, 7-1023, 7-1024, 7-1025, 7-1026, 7-1027, 7-1028, 7-1029, 7-1030, 7-1031, 7-1032, 7-1033, 7-1034, 7-1035, 7-1036, 7-1037, 7-1038, 7-1039, 7-1040, 7-1041, 7-1042, 7-1043, 7-1044, 7-1045, 7-1046, 7-1047, 7-1048, 7-1049, 7-1050, 7-1051, 7-1052, 7-1053, 7-1054, 7-1055, 7-1056, 7-1057, 7-1058, 7-1059, 7-1060, 7-1061, 7-1062, 7-1063, 7-1064, 7-1065, 7-1066, 7-1067, 7-1068, 7-1069, 7-1070, 7-1071, 7-1072, 7-1073, 7-1074, 7-1075, 7-1076, 7-1077, 7-1078, 7-1079, 7-1080, 7-1081, 7-1082, 7-1083, 7-1084, 7-1085, 7-1086, 7-1087, 7-1088, 7-1089, 7-1090, 7-1091, 7-1092, 7-1093, 7-1094, 7-1095, 7-1096, 7-1097, 7-1098, 7-1099, 7-1100, 7-1101, 7-1102, 7-1103, 7-1104, 7-1105, 7-1106, 7-1107, 7-1108, 7-1109, 7-1110, 7-1111, 7-1112, 7-1113, 7-1114, 7-1115, 7-1116, 7-1117, 7-1118, 7-1119, 7-1120, 7-1121, 7-1122, 7-1123, 7-1124, 7-1125, 7-1126, 7-1127, 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THE Packard Diesel

AIRCRAFT ENGINE

By EDWARD P. WARNER

Editor of Aviation

THE DEERONT SHIVA brings the Packard Diesel aircraft engine into the light of day. Built upon the Packard Company's own stand and available to a number of airplanes by different manufacturers, it will be eyes to the convenience of the motor public.

For two years in detail have been a well-kept secret. Early in 1928 its existence was guessed at. In the summer of that year official report was made that a had flown as the power plant of a Hispano airplane, the first occasion of an aircraft driven by an engine without electric facilities. Late in that fall and again within its last few weeks the writer was privileged to ride behind it. In December Capt. L. M. Woodson, the designer, gave a broad indication of some of the engine's general characteristics in a talk before the Society of Automotive Engineers in Chicago. In May, 1929, it gained public attention and the headlines came when it was sent upon its first cross-country trip, carrying Captain Woodson from Detroit to the annual field day of the National Advisory Committee for Aeronautics at Langley Field. In April, 1930 it is finally revealed.

In general appearance and in general behavior on the dynamometer stand or in flight the Diesel is in no vital particular dissimilar from the radial air-cooled electric-ignition gasoline-fed engine that it replaces, except of course for a change in the form around the cylinder head and for the absence of most of the conventional accessories. The Packard engine at its present stage of development, the model which is to be on exhibition at Detroit and which has recently received the Department of Commerce Approval Type Certificate in the form of the familiar Whitehead and Wright, the standard air-cooled types of the time when the Diesel was undergoing its early development in being a nine-cylinder radial. Like the J-5 air-cooled Wright, the only conspicuous small radial in use at the time when the Packard engine was first put into the air, it develops 225 hp. under normal rated conditions. Normal speed is 1,950 r.p.m. Weight 520 lb. Thus the engine weighs 2.35 lb. per hp. On the occasion of making the power curve reproduced beneath the rated power was exceeded by about 10 hp.

To get that output the cylinders have been given a bore of 4½ in. and a stroke of 5 in. The piston displacement is therefore approximately 980 cu. in., the power output 9,500 hp. per cu. in., the brake mean effective pressure 94 lb. per sq. in.



Capt. L. M. Woodson, designer of the engine, and Walter Lane, test pilot before the dynamometer airplane.

The overall diameter of the engine is 45 in. It happens that the power, weight and over-all diameter are all within two per cent of being identical with the corresponding figures for the J-5. Both the bore and the stroke in the Diesel are, however, somewhat larger than in the comparable gasoline engine, the piston diameter being 25 per cent greater and the mean effective pressure considerably lower. The exceedingly small clearance need in a Diesel engine and the simplicity of the valve gear for cause help to keep the over-all diameter down for a given work.

There will be few readers of *Aviation* for whom



Packard Diesel in the motor with exhaust manifold.

there is any accuracy of terminology of the Diesel principle, but those who have had no recent contact with or occasion to give thought to the type may be reminded that the essential feature is the compression of diesel fuel by the heat of compression alone. Compression ratio must, therefore, be exceedingly high to insure that the temperature due to rapid compression of the air in the cylinder will be above the ignition point of the fuel and will convert it as rapidly as it is sprayed into the chamber above the piston. Theoretically, in the ideal Diesel cycle the combustion takes place just rapidly enough to keep the pressure constant as the piston descends for a substantial part of the stroke and until all of the fuel that stroke has been injected. In practice, there are considerable departures from the ideal, especially on high-speed Diesels, just as high-speed gasoline engines show large deviations from the ideal Otto cycle, with combustion at constant volume while the piston is on or just past the top dead center.

Of the numerous problems that have beset the designer of high-speed Diesels in the past, the most serious have been to control the inflow of fuel so that it would be evenly and completely consumed in the infinitesimal space of time available and at precisely the right point in the cycle, to provide satisfactory flexibility characteristics, to insure easy starting, and finally, and for aircraft work most important, to so harmonize mechanical design with the thermodynamic characteristics of the engine as to keep the weight within reasonable limits. Captain Woodson with the aid of Dr. Herman Thurner, who came to the work from a long Diesel experience in Germany, has at least in a very considerable measure achieved those specific problems.

To the specialist in Diesel problems such the most striking feature of the Packard engine is the very high maximum pressure permitted in the cylinders. There has been a widespread belief among students of the type that satisfactory results for aircraft work could only be secured by keeping the maximum pressures, and the consequent stresses to comparatively low values. It is with the development of low-pressure Diesel operation that the work of the National Advisory Committee for Aeronautics has been least largely concerned. Pressures of 900 to 800 lb. per sq. in. have been considered

desirable. In the Packard the design is based upon maximum cylinder pressures sustained in excess of 1,200 lb. per sq. in.

General Operating Cycle and Construction

THE GENERAL thermodynamic characteristics of the engine can be best described by following through the cycle of operations, which to be sure is in general common to all Diesel engines for all purposes, but with the specific figures and facts inserted to apply to the Packard model.

At the beginning of the intake stroke the piston is at top dead center and the cylinder is very nearly evacuated for the compression ratio of 16 to 1 allows a clearance space of only about 7 cu. in. in each cylinder, or a mean clearance breadth above the piston of about three-eighths of an inch. With the piston in that position the valve (it is a notable feature of the design that there is but one to each cylinder) is open to the surrounding air. As the piston moves downward air is sucked into the cylinder, precisely as the explosive mixture is sucked through the intake valve in a gasoline engine. Thirty-four degrees past bottom dead center the valve closes, and the air in the cylinder is compressed as the piston moves upward. So far there is no change of the course of events characteristic of a gasoline engine, except that the cylinder is filled with pure air instead of an explosive mixture of air and gasoline vapor. The compression ratio being, as already noted, 16 to 1 and the compression being nearly adiabatic, the pressure in the cylinder rises to about 300 lb. per sq. in. and the temperature of the air to approximately 1,000° Fahrenheit by the time the piston has reached the upper limit of its travel. Before that time, however, about 45 degrees of crankshaft travel before, top dead center is to occur, the tappet that operates the fuel port (at the death of which some later) starts to force the plunger upward in the pump. The fuel which the pump chamber contains is thus forced out into the working cylinder in a fine spray, which immediately ignites, as the temperature of the air is above the flash point of the fuel.

As already indicated, the ideal Diesel cycle calls for the injection and combustion of fuel to start at top dead center and to continue for a substantial part of the downward stroke of the piston. In the Packard engine, designed for high-speed operation, the injection starts at 45

degrees before top dead center and continues approximately until the upper limit of the piston movement is attained. And as immediately after this point, the compression pressure of about 1,200 lb. per sq. in. at work space throttle is reached.

During the downward movement of the piston the heated gas expands and the pressure gradually falls until with the piston about 45 degrees short of bottom dead center the valve is reopened. The exhaust begins at this point and continues through the upward stroke.

The cycle of operations is then complete. The single valve thus opens and closes only once in each cycle, amounting open for a total of approximately 440 out of the 720 degrees of crankshaft travel.

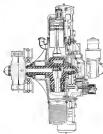
So far as the pilot of the airplane is concerned, the operation of the engine is in no particular manner different from that of a piston engine. It looks much the same to the casual glance. It is controlled through a single throttle in the same way, and responds as positively. The sound is very much the same. While the color of the exhaust is distinctly different, and may be noticed in an open cockpit ship, the difference is not so conspicuous as to force itself upon the pilot's attention. As will be indicated later, the operations of starting are essentially similar except for the absence of a switch. Since the engine is similar to the gasoline type in weight, power, and dimensions, it goes without saying that no differences are apparent in the external features of the airplane. A light open-cockpit machine with the engine installed looks, feels, and spins with customary facility.

Fuel System and Combustion

ALREADY INDICATED, the fuel is prepared into four cylinders by nine separate pumps, one for each cylinder. One of the first problems in design of a fuel system and combustion chamber for a high-speed Diesel engine is the proper mixing of the fuel and the air. For a number of years the National Advisory Committee for Aeronautics has been conducting elaborate researches on spray penetration in combustion chambers, studying various forms of nozzles and the effect of varying the spraying pressures, and the conditions with which the pressure was applied it had been the general experience that the maximum penetration that can be obtained with a spray of very short duration is actually small, at least in comparison with the cylinder dimensions. Half an inch is a good penetration. In the case of the Packard engine the time available for putting the fuel into the cylinder is about 0.004 sec. Under these conditions the designers have adopted an expedient which is also being used in modified form on several recent European Diesels for high-speed aircraft instead of trying to spray the fuel across the air supply, they seek artificially to create a turbulence which will sweep the air past the nozzle, taking up the incoming fuel as it goes. The desired turbulence and air-carrying irregular motion of the air around the combustion chamber is secured, as will be seen in the sectioned rear view of the engine (reproduced herewith) by giving the inlet port the form of a flattened V-shape directed tangentially around the cylinder bore. The photographs of the cylinders also give some indication of the layout. The air enters at high speed, and moving around the cylinder in a counter-clockwise direction as seen from the head end the motion permits long enough, yielding some operating experience with the engine, so that practically all of the oxygen comes in contact with the fuel spray despite the very limited direct penetration.

Working back from the cylinder to the fuel pump, a characteristic feature of the Packard design is found in the use of nine separate plunger pumps, one for each cylinder, and placed as close as is mechanically convenient to the combustion chamber for which they furnish the fuel. The arrangement has the dual advantage of reducing the likelihood of failure in the piping system from the pump and of eliminating the effects either of stretching of the tubing under the stresses present which the pump generates or of contracting the fuel itself and trapping it into the cylinder in a series of surges, corresponding to successive pressure waves. Air locks also make trouble in long pipes.

The fuel pumps and spray nozzles are almost a single unit. The spray pressures run to a maximum of 6,000 lb. per sq. in. The pump is of a simple plunger type.



and will leave be described in mechanical detail. The spray nozzle is of a cone form, containing a small pressure valve. The spray is thus caused. To make it unnecessary to force the valve off of its seat against its spring before the injection of fuel can start, there is a separate stop screw facing against the end of the valve stem and holding it a few thousandths of an inch off the seat at all times. This slight cracking of the valve is particularly important for easy starting, as well as for the explosion of any trapped air. To prevent any backing up of gases from the combustion chamber into the fuel pump a small check valve is inserted in the barrel between the pump and the nozzle.

Turning back to the outside side of the pump, via a line extending all around the engine, as shown in several of the photographs and in the rear elevation drawing, a fuel pump of ordinary form draws the fuel from the tank and keeps it circulating through the entire system. The fuel passes from the tank into the pump cylinder through ports opened by the movement of the piston. A screen protects the entry to the pump.

Although perfectly mechanical features will be left for later description, the method of starting and control of the fuel pump should be examined in connection with the explanation of the general functioning of the fuel

system. It is shown with admirable clarity both in the second rear elevation and in the photograph of the engine with the rear cover plate of the combustion removed, exposing the accessories. There is a cam ring, as no essential particular dimension from that used on radial gasoline engines. It operates on tappets, which in turn operate the pump plungers through short slipper rods arranged near their lower end by ground links.

It is upon the detail of this linkage that the control of engine power depends. The lower end of the fuel-pump operating tappet sits in a specially formed channel provided in the pivot rod that leans directly against the cam. The pivot rod just mentioned is attached at one end to the tappet and at the other to a circular cover ring connected with the crankshaft (see drawing in the drawing and in the photograph), the rotation of



which ring about the center of the engine is controlled by the "throttle" lever. Rotating the ring changes the obliquity of the tappets to the pump plungers, and also changes the distance from the pivot to the rock arm to the point at which the tappet slides connect with its surface in the ground channel provided. As the point of contact is moved further away from the point of the roller arm, the least travel required to the tappet, and therefore the stroke of the pump, increases. The control of engine output is entirely through this variation of fuel-pump stroke. The engine is stopped by throttling back (putting a spring stop which limits the ordinary travel movement) to such a point that the pump plungers move no higher than the inlet port in the pump cylinder and consequently draw no fuel to the spray nozzle.

To help the engine to run more smoothly at low speed a special idling control is provided. It will be noticed in the photograph that the intake and the exhaust ports, communicating with the single valve are in the form of a straight tube, four to each cylinder head, open at its forward end to the atmosphere and at its other end to the exhaust manifold. The normal flow of air when the engine starts the intake air is at the forward end and the major part of the exhaust out at the rear. For idling, however, a shorter valve is inserted on each cylinder

head to close off the open end of the air tube. These leaders are secured by means of a cam connected with the throttle, so that when the throttle is nearly closed the intake air is being drawn back through the exhaust manifold. With this control in operation it is possible to run the engine steadily at speeds as low as 250 r.p.m.

Fuel Requirements

THESE ENGINES have been tried, and have operated with a reasonable measure of success on many different fuels of fuel. The essential requirements include, however, not merely the ability to run but also, commercial availability, cleanliness as commercially delivered, to avoid choking of the fuel passages in starting of nozzles; a low enough pour point and viscosity to insure free flow from the tanks through pipes of reasonable diameters, especially at the low temperatures of winter or high altitude; a good degree of "sweetness" to reduce the problems of lubrication of the fuel pumps suffered even of products from crude petroleum, and suitability in a grade enough rich to the total supply of crude, to secure a reasonably low price, even if the demand becomes very high.

The conditions have been met most nearly by the satisfaction of the Packard Company by domestic furnace oil, which has gravity of approximately 32 deg. Baumé, and that fuel has been used in most of the test flying. The engine will operate on gasoline, but not satisfactorily, as the lack of "sweetness" would cause rapid wear in the moving parts of the fuel system.

Starting

THE STARTING is essentially similar to that of a gasoline engine. An inertia motor is used, and the only difference in technique are that there is no switch and no preliminary priming or choking, the throttle being held wide open when the fuel starter is thrown into action. When starting at low temperatures some pre-heating is necessary, and is provided by an electrically heated glow plug in each cylinder. These plugs are permanently connected into the starter motor circuit so that they are heated whenever the starting motor is being energized, so independent action on the part of the pilot being unnecessary. They are only needed when starting, and are entirely inoperative at other times. Although the glow plugs are only required at low temperatures, in the absence of auxiliary they are left permanently connected up, and are used regardless of engine temperature.

In the early experimental work several other means were used, especially an explosive type using a blank shotgun shell as the actuating means, but they were subsequently abandoned in favor of the inert type.

High Altitude Operation

SPURRED upon the aircraft Diesel have frequently forecast that the engine would be unable to operate at high altitudes, an insufficient heat of compression would be developed. It is known that in some cases there has been serious difficulty in operating industrial Diesels in South American mines and in other points far above sea level, but the temperature developed in compression should theoretically depend only on the compression ratio, not at all on the initial pressure of the air, and in practice the Packard company appears to have experienced no difficulty with its engine at altitudes of the order of 15,000 ft. above sea level without any special accessories on the engine and without any failure of its functioning.

One of the peculiarities of the Diesel is its task—its job—for a given throttle setting (either full throttle) with increasing altitude, as opposed to the usual drop of speed in the gasoline type. The amount of fuel injected into the cylinder is quite independent of altitude, being dictated by the fuel pump under control of the throttle, and if the engine be throttled back to develop half of its full power at sea level, the amount of fuel injected is sufficient to combine with all the available oxygen, this giving the operator full throttle operation at that altitude. Conversely, it is of course inadvisable to keep the throttle wide open at high altitudes, as so even if the fuel being the oxygen agency of the available oxygen would then be injected. Otherwise there is no need and no opportunity for a separate rev limiter control on the Diesel.

Reverse Power

ONE INTERESTING FEATURE of the Diesel is the possibility of "backdriving," securing a considerable increase in torque and power output beyond the rated power at the sacrifice of fuel economy. For taking off and climbing, the engine power can be temporarily increased by about 10 per cent at the expense of a fairly great increase in specific fuel consumption. The explanation lies in the necessity of providing a certain amount of excess air to insure complete combustion of the fuel injected. The normal rating of the engine is based on a 25 per cent excess of the limits be sufficient to burn the fuel and the amount of fuel that flows into the cylinder is increased to the full theoretical amount with which the oxygen content of the cylinder could combine chemically. Consequently, while actually be incomplete and economy correspondingly poor, but as already indicated the power would be stepped up. The economies come under these conditions is shown by a trial of smoke.

Lubrication

THE LUBRICATION SYSTEM is in a general way similar to that of a gasoline engine. As in other fuels, it is a dry-sump system in which, the oil being pumped from the tank and fed to the engine through a special hollow rubber air pin opposite No. 4 cylinder. At the inward end of this pin a groove is arranged in the crankcase diaphragm and a radial hole is drilled leading the oil to a nodular cast-iron sump which receives one end of what appears to be a hollow dash-bell. The other end of this swinging connection engages a socket in a forged rail floating on the hub of the cam. The oil is fed through a groove in this ring to several holes in the cam and thence through the passages in the cam to the radial hole in the crankcase bell. It might be mentioned in passing that the purpose of the dash-bell connection referred to is to allow the oil ring to float constantly on the cam without being restrained in any direction by the connecting member.

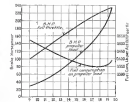
The rear crankshaft is drilled in line with a hole in the crankpin connecting with the interior thereof which is bored out for lubrication and to act as an oil reservoir. A hole is drilled in the crankpin for lubricating the connecting rod bearing which is formed of two flanged bearings mounted side by side with a small space between them. Oil flows through this space into slots machined in the cast-iron connecting rod big end and thence through small holes drilled in it to enable it to bring oil under pressure to the link rod pin bushings.

Returning to the crankcase diaphragm oil passages the same radial feed hole which supplies oil to the oil

ring located to it is extended to feed a groove surrounding the rear roller bearing hole. This diaphragm groove distributes oil through eight other radially drilled passages to each of the hollow roller arm shafts. These shafts, in turn, are drilled radially with small holes to provide pressure lubrication for both the fuel and valve rocker arms. The valve rocker arm is further provided with a small drilled passage in one of the ribs leading out to the rocker arm roller pin and this pin is drilled with several radial holes to lubricate the roller bearing. The crankcase cover is also drilled with various passages so that positive lubrication is supplied to the various accessory shafts and their bearings.

On the return draft the oil thrown from the various bearings gathers in the bottom of the crankcase, a slot being provided at the bottom of the diaphragm to permit the oil from the front compartment of the crankcase to flow to the rear compartment.

The scavenging oil pump is mounted in a unit with the pressure pump and return line of the scavenging pump consists merely of a goose-neck shaped tube shaped to



Performance of the crankcase-hull in cylinder radial diesel engine (power data corrected to standard sea level, 59° F. bar, 1000 ft.)

the inside of the crankcase cover and attached to a main vertical fuel passage to send the oil from the floor of the rear crankcase compartment.

The scavenging pump then discharges the oil back to the oil tank in the rear of the gear. It will then be seen that all bearings within the engine are positively lubricated except that the anti-friction bearings, piston pin bushings and cylinder walls are lubricated by splash or spray in the crankcase housing.

The external valve rocker arm bearings are of the roller bearing type and are lubricated principally by means of a pressure gun, each lubrication being required every 25 or 30 hours of engine operation.

The relief valve in the oil feed line is set to operate at 60 lb. pressure.

Mechanical Draft

IN ORDER to keep the weight of the Diesel low enough to make it competitive with the gasoline engine, the utmost refinement in mechanical design is necessary. Captain Washon observes that it is easier to design a Diesel on theoretical principles than any other type of

engine, since there is no abnormal condition, such as detonation introduced into the machine pre-ignition to allow for. Maximum operating pressures can be accurately forecast, and the design based on the anticipated normal condition with some assurance that they will not be exceeded.

Perhaps the most striking mechanical feature of the design, well shown in the opening front photograph, is the use of a cone gear mechanism, with provision for distributing the tension load on the cylinder bases due to explosive pressure over a large part of the periphery of the crankcase before transmitting them through to the main bearings. In place of cylinder studs which necessarily impart a certain load to the crankcase, two clamping heads carrying around the cylinder are over the bases of all the cylinders are used. These heads are tightened up by turnbuckles so that an initial tension is set in such which exceeds any operating stresses resulting from the cylinder explosion. The crankcase is thus subjected to an actual tension, and the light alloy is never allowed to sustain tension which it is ill adapted to resist. The crankcase weighs but 34 lb.

The explosion pressures in the Diesel being very high, precautionary steps have had to be taken to protect the major structural parts against impact loading. This has been accomplished primarily by a device consisting of the crankshaft counterweights and the propeller, so that when the peak pressure exists there is a certain amount of cushioning between the crankshaft and the parts that have the maximum structural limits. Stresses in the crankshaft are thus kept greatly reduced.

To be specific, the crankshaft counterweights, instead of being rigidly bolted to the crankshaft or forged integrally with it, are hung on a joint and centered between powerful springs. When the crankshaft is suddenly accelerated, the counterweights lag behind slightly to reduce the effective inertia. The inertia of the propeller, instead of being applied or locked to the crankshaft, is allowed to float on an extension of the crankshaft driving end. The propeller blade clamping rings driving pins which receive the driving effort from a two-armed driving member splined to the crankshaft (well shown in one of the photographs of the engine room of an engine). At the end of each of these arms the corresponding propeller drive ring-driving pin is held between two compressed rubber blocks, permitting of a small amount of yielding. The propeller shaft is thus cushioned from driving shocks and can be made accordingly light.

Arguing with experience of torsional vibration will immediately be suggestive of this allowing torsional freedom, as likely to aggravate vibration troubles. These appear to be overcome by the advent of hysteretic damping of the rubber blocks, together with the cushioning of friction between the parts power absorber.

The cylinders weigh only 114 lb. The least losses through the cylinders will be lower in a Diesel type than in a gasoline engine, it was felt to be unnecessary to use a separate cylinder head of aluminum alloy for the rear heat conductor. A diamond steel cylinder is therefore employed, with an aluminum alloy cover, cast and with cooling fins, held over the top by studs.

The primary function of the cover is to furnish a mounting base for the valve gear. The valves are operated by a conventional push-rod and rocker-arm gear from a cam driving integral with the driving fuel passage. In accordance with past Diesel practice on gasoline engines, a multiplicity of springs are used (as shown in one of

the photographs). The steel number on each valve is twelve, the object being both to prevent the liability of loss of a cylinder due to the breakage of a single valve spring and to reduce the possibility of spring failure during the valve operation cylinder.

Pistons and connecting rods follow standard practice, the master rod assembly being of the conventional type. The pistons are of aluminum alloy. The piston force is shown in one of the photographs, the asymmetrically placed pocket helping to provide the working surface necessary to high-speed operation. Each piston carries two compression rings and one scraper ring low on the skirt. The crankshaft is also normal being of the light type with the front and rear halves bound together by a clamping bolt. The main crankshaft bearings are both roller bearings, the front one being mounted in the crankcase itself and the rear one in a removable plate or diaphragm fitted into the crankcase in line with the rear cylinder-clamping head. The design of this is located in part by study, and carries most of the working parts pertaining to the fuel system as well as the rear main bearings.

The crankcase, as previously noted in connection with the mention of the method of cylinder attachment, is a one-piece casting of magnesium alloy. The casting includes both the mainline portions of the crankcase and the front of the cylinder.

Most of the accessories are housed inside the rear end of the crankcase either between the diaphragm just alluded to and the cover plate or on the outside of the cover plate itself. None of the accessories offer any special mechanical problems as to their design or installation except the fuel pumps, which have to operate in so short a free interval in each revolution that the acceleration and dynamic load becomes enormous. Some of the parts operate at accelerations as high as 15,000 ft. per sec. per sec. or nearly 500 times gravity.

The piston is made of aluminum alloy. The plunger is of heat-treated steel. The adjustment tappet screw is to depress the plunger upward in its cylinder, the return being effected by a compression spring surrounding the cylinder.

THIS DESIGN has been described comes in the Show with several thousand hours of its test record, operating some thousands of miles in cross-country flying in two places, a Stinson monoplane and a taper-wing Waco, below it. A single engine has been run for 500 hr. as the dynamometer without overhaul. Flight experience has included a great variety of tests under various conditions, including the use of radio in the plane to furnish direct verification of the illusion that there can be no radio interference where there is no electrical apparatus. Temperatures as low as 17 deg. below zero have been encountered. The general performance of the Diesel was very satisfactory, and with that of the same machine equipped with a gasoline engine, as might have been anticipated, since neither weight, power, nor frontal area were appreciably changed. The fuel consumptions, however, was reduced, being between time and ten gallons per hour when cruising. The fuel consumption of the Diesel was very satisfactory, being as good as the gasoline engine, while with the gasoline engine the best possible consumption for any given throttle setting is only to be obtained by a more exact regulation of the mixture control than the average pilot is likely to give.

DESIGN DETAILS OF THE *Packard-Diesel*

Piston rings and piston pin centers to ensure proper strength for the shape of the piston head.

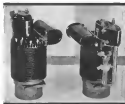
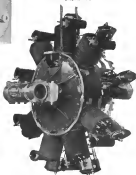
The camshaft resembles a magnifying glass.



Exhaust valve, showing particularly the shape of its two ports and the driving of the camshaft. Upon the two ports, cylindrical the camshaft, the two ports are mounted by spring.



Quarterly front view, exhaust valve. Shows the installation of exhaust manifold and gasifier valve.



Front and rear view. The fuel pump is in the air. The fuel pump is in the air. The fuel pump is in the air.

AIRCRAFT ENGINE



Fuel pump and spray nozzle, use for fuel injection, are made up as a unit.



Each valve has double springs mounted on a spring arm.



Below: From the rear, with exhaust valve installed. At left, fuel valve with double valve mounted, the pump operating and exhaust valve becomes visible. Note fuel pump with valve and piston.



Cylinder and head and valve cover. The head cylinder has a round end with a round plate to carry the intake valve and valve arm.



A line of biplane planes at the 1939 All-American Show

THE THIRD All-American

Some Interesting High Lights
Detroit During

ANNUAL Aircraft Show

on Exhibits and Activities in
Air Show Week



A section of the Caudron chapter at the 1939 Detroit Show

By JOHN T. NEVILL
Detroit Editor of Aviation

WHEN THESE LINES are published the third annual All-American Aircraft Show will have opened in Detroit. There were little doubt but that the industry will attend the show with a new and stronger hold upon itself. That is to say that it will probably have had and shoulders, at least, out of the financial depression that settled upon all business since our financial crisis. Moreover, it would seem that the industry has looked forward to the Detroit show as an ideal place and time to compare notes on certain all-important experiences that have come to a head most recently, these experiences being both economic and technical. Many months ago the feeling in the industry was mutual that the airplane had been sufficiently advanced, technically, to warrant more or less general acceptance by the public. This was followed by a period of excessive and decidedly unwise production, or rather over-production, which was made more easily and in some cases calculated, by the stock crash of last fall. More recently the industry has come to realize that it had taken the "idea selling" phase of 1937 '38 and '39 entirely too literally, that the selling of aviation as a youth-while activity was not to be done. Therefore, the merchandising of aircraft and aircraft range has become the major thought of the hour.

Pioneered by air transport operators the industry about five months ago began experimenting with price reduction as a means of attracting public patronage. So far, spending generally, the experiment has shown the operators that high fares have kept approximately 50 per cent of their seats empty, also that larger passenger planes are needed. Price reduction is the counterfeiting field it still has two new experiments to know much about when the results will be. Those who started it are confident of its benefits.

The foregoing thoughts have been emphasized here

at the start solely because they constitute the themes underlying the third annual All-American Aircraft Show. Reduced prices in small aircraft increased passenger carrying capacity in the larger types and Detroit type engines will comprise the keynote of the show.

The third annual All-American Aircraft Show, as during the past two years is sponsored by the Aircraft Bureau of the Detroit Board of Commerce, sanctioned by the Aeronautical Chamber of Commerce of America and managed by Ray Cooper, of the Detroit Board. The same group of automobile financiers and bankers is on the Show's executive committee, and the industry can safely assume that the dynamic quality that has characterized Detroit's two preceding shows will continue.

Apart from the usual number of new planes and new models of established planes two outstanding features will set the show apart from anything of its kind ever attempted heretofore. Probably the most important of these is the first public showing of the long-awaited Duesel. Second, the exhibition will be held on an airport, approximately five miles from downtown Detroit and will cover 150,000 sq. ft. of the largest airplane hangar in the world, an imposing 310,000-sq-ft structure containing a total of 205,000 sq ft of floor space. (The Detroit City Airport and Municipal Hangar is described in another article in this issue.)

Elaborating a bit on these features we return again to Duesel engines. The Packard Motor Car Company, builder of the only Duesel type airplane engine in this country that might be regarded as proven, will display its 225-hp. Duesel in the All-American Show. (This engine, which has been under development by Capt. L. H. Wadsworth, of the Packard Company, for several years, is described in detail elsewhere in this issue.) Further, since that it is virtually certain that the Packard Company will have its two Duesel powered planes—a Stinson-Detroiter and a Waco—on the field in order to demonstrate them in flight.

The Stinson Aircraft Corporation, a subsidiary of the Cessna Corporation, which concerns supposed manu-

facturers at St. Louis with its well-known mass production-low price announcement will exhibit a Stinson Junior equipped with the Packard-Duesel. Rumor has it, in fact, that there will at least be half a dozen planes in the show powered with Duesels. Although, at this writing, no definite announcement has been made, planes likely to be so equipped will include, besides the Stinson, the Ryan, the Waco and the Verville. A report that Ford would display one of his tri-engine, all-metal monoplanes with Duesel powerplants, remains unconfirmed as this is written.

THE DETROIT SHOW, according to the latest figures will contain a total of 62 airplanes and four gliders, entered by 44 manufacturers, when covering subsidiary companies as units. There will be 115 primary booths, covering some 100,000 sq ft, and approximately 15 engine manufacturers. Judging by the exhibits entered a more representative aggregation could scarcely be brought together.

That the Detroit show will be held under one roof, upon one floor, and within a few feet of demonstrating planes on the field is an unquestionable asset to the industry as well as to the show's backers. The tedious and expensive process of towing a plane, some wings through automobile laden streets, has been eliminated, but Detroit City Airport is but little better from downtown Detroit than is Coney Island, where the All-American Show has been held previously. Nor is demonstrating on the airport necessary—even for the Fokker F-32, which will be the largest plane in the building. Most of the exhibited planes, in fact, will have been flown to the airport, stored in the hangar's numerous open, cleaned of fuel, and rolled in to its exhibiting area. Gliders, of course, will have been shipped in, in crates from, some of them it is understood, directly from St. Louis, where they were last exhibited.

Each of the exhibiting areas, by the way, have been given numbers along "avenues" or passageways of various width aptly and properly called "avenues" and bearing such names as Lindbergh, Richard Byrd, Mason, Peters,

MacCready, etc. The huge structure's interior will be decorated largely in blue and gold, more than \$5,000 worth of bunting being required for this work.

Although the Detroit Convention has designed the All-American Show as an advertising and sales medium for the industry it is determined to let the exhibitor whose sales or subscription methods are not in keeping with the dignity of the industry or character of the show. The "good faith" check of one would-be exhibitor was returned because of so-called "laid-out" tactics practiced by the exhibitor at the St. Louis show. While spending of the rules it is worth mentioning that children under 16 years of age will not be admitted unless accompanied by parents or guardians. The advisability of admitting small boys to aircraft shows is still a moot question in the industry. If accompanied by an adult, escort children under 16 will be admitted for 25 cents, the price of admission for adults being 75 cents. As to past years exhibitors of airplanes are not being charged for space, although a charge of 50 cents per sq ft has been levied against accessory exhibitors.

With the idea of allowing the exhibitors as much time as possible to make contacts and sell airplanes, the week of the show, April 8-12, has been kept practically free from meetings, the only gatherings of this kind being those of the S.A.E., the Women's S.A.A. and two meetings participated in by history purchasing agents. The first of these last named meetings, according to plans will be between the buyers and men from whom they purchase materials, the second being for the buyers themselves. It is hoped as a result of these conferences, to effect closer, more efficient co-operation between the two groups and to leave them with a better understanding of one another's problems.

The week as a whole has been divided into designated "days." Saturday, April 8, being opening or Debut Day; Sunday, April 9, being opening of the doors has been set for 10 p.m., instead of the usual 7 p.m. This will be preceded rather by a formal debriefing ceremony participated in by prominent aircraft and Detroit municipal officials. Sunday will be Famous Pilots Day, Monday,

Ladies' Day, Tuesday, International Day, Wednesday, Engineers' and Officers' Day, Thursday, Delegates' Day, Friday, Governor's Day, and Saturday, Family Day. A public demonstration on the airport, Wednesday afternoon, will follow a discussion of that subject by members of the S.A.E. at the Brook-Cadillac Hotel. The rapidly increasing interest in aviation flight should make the afternoon's program especially interesting.

Sessions of the S.A.E. will occur three days, Tuesday, Wednesday and Thursday, all of them being held at the Brook-Cadillac Hotel. Among the speakers, besides the various sessions will be Capt. L. M. Washburn, Pfundman Motor Car Company; E. P. Lutz and Wesley L. Smith, National Air Transport; T. P. Wright, Curtiss Aeroplane and Motor Co.; and Edward F. Warner, editor of *Aviation*, and president of the S.A.E.

Tuesday, International Day, has been set apart in honor of the Mexican, Canadian and other foreign aircraft leaders who will be in attendance at the show. At least two big dinners will be staged in downtown hotels, these being the S.A.E. dinner, to be held Tuesday evening at the Brook-Cadillac, and the Aviation dinner, scheduled for Thursday evening at the Skidder. Hereafter, these two banquets have been held jointly in Detroit.

Aircraft inspectors, the municipal airport is located within a radius of about 20 minutes from any downtown hotel. The Detroit Police Department and the Detroit Automobile Club are co-operating with Manager Cooper in working out suitable traffic routes to and from the airport. Although a Grand Avenue street car will take one directly to the door of the exposition building, both the Detroit Street Railway and the Detroit Motor Bus Company will operate special lines serving during the week. An almost isolated automobile parking area is provided just outside the airport fence along Connon Avenue.

A "safe and sane" set of air traffic rules to be in effect on the airport during the week has been drafted by William J. Wallace, engineer-in-charge of the port, and R. D. Bridgner, Dept. of Commerce inspector, Detroit district. These rules (contained in the airport article in this issue) will be strictly enforced by a special squad of "acro-motored" police officers working under direction of Mr. Bridgner and several additional Commerce Department inspectors. Printed pamphlets containing the rules, a map of the airport and other information relative to Detroit flying fields have been mailed by city officials to all exhibitors.

Manager Cooper this year is departing from the past custom of "turning to local interest" in the show by means of numerous automobile luncheon meetings held by local civic organizations and addressed by prominent members of the industry who are attending the show. The wisdom of this departure is evident in some quarters, being pointed out that guests will seldom and that special arrangements in part over the "people of aviation" are being overlooked. However, that remains to be seen. Mr. Cooper, meanwhile, is laying his bets on the interest-causing aspects of the show, itself, concentrating his bill for cash receipts in a carefully planned publicity and advertising campaign focused, in a major degree, on local interest. It was last year, the center of publicity has been placed in the hands of Henry O. Whitcomb, veteran Detroit newspaperman.

From information available at this writing it would seem that 74 of the ships exhibited will be of the last variety, while eight will be of the flying boat or amphibious type. With the exhibits with which very little place may be converted into a hangar, hangars have not been included in the latter group. Because of the increasing popularity of over-water craft it is likely that a half dozen or more exhibitors will display water landing gear either installed on or alongside their craft. Speaking of water type aircraft coming into view the Detroit Flying Club probably will come upon the show as an ideal time to announce plans for a 2,500 mile over-water tour around the Great Lakes—a tour projected for next summer.

Just how many new planes will be displayed cannot be told at this writing. However, among them will be the new Sikorsky 5 plane, amphibious, the all-metal Towle amphibious, a craft employing a very unusual method of internal wing bracing, the new Sperry 4 place cabin monoplane, the 4 place long-legged Inneson amphibious, the Crosley "Moonbeam," a 2 place open biplane, and the 6 place, tri-engined Copley "Olympic" cabin monoplane. It is also likely that Consolidated will exhibit the all-metal "Pleasant" monoplane, and that Detroit Aircraft will show the new all-metal Lockheed.

The Detroit firm is converting the Eastern flying boat into an amphibious. Whether or not the Eastern amphibious will be ready for the show is not known.

From the point of view of number of places the 1930 Detroit show will be smaller than it was last year, when 100 different places were shown. This, no doubt, is due to the many mergers that began in the industry more than a year ago, and, in some extent, to the ever increasing number of aircraft shown the industry is constantly being asked to patronize. It is to be noted, though, that the 1930 show exceeds by more than a dozen the number of places exhibited in the first All-American show in 1925.

PRACTICALLY all members of the Show's Executive Committee are widely known in the industry, officials of the Committee being Edward S. Evans, chairman, William B. Mayo, Frank W. Blair and William E. Metzger, vice-chairmen, Harvey J. Campbell, secretary, and Mr. Cooper, manager. Other members are Capt. L. M. Washburn, Harry R. Graham, William Richard Wilson, Harold H. Sawassee, Charles T. Bush, Norman B. Cooper, Griffith Opler Ellis, Eugene W. Lorenz, Sidney D. Walden, Philip Newberry, D. Dwight Douglas, W. S. Wagner, James S. Merrill, and G. H. Heston.

With five exceptions, all of the members of the city's automobile industry—who have earned the city's fame to all corners of the world. It is, therefore, not so surprising to be told that they are the financial and engineering giants who have placed a very helpful shoulder to strengthen in and about the Motor City. As an aside, it is well to note that the vast staff of the largest automobile manufacturers in the country have extended invitations to 30,000 automobile dealers and distributors asking that they attend the city's third annual All-American Aircraft Show.

Since the first All-American Show in 1925 the aircraft industry represented the Detroit exposition in one of the largest, if not the largest, enterprises of the city of the year. So long as the present enthusiastic yet lead-headed local support continues, it is likely to be repeated so for some time to come.

General Schedule of Events

1930 ALL-AMERICAN AIRCRAFT SHOW AT DETROIT

Friday, April 4
10 a.m.—Official Opening, 1930
Aero., Brook-Cadillac

Saturday, April 5
Opening of Exposition
10 a.m.—President Evans and city officials leave City Hall for Ford County, Michigan, to visit the Detroit Municipal Airport.
11 a.m.—Formal dedication of new hangar and opening of show.

Sunday, April 6
Flight Day: special races for three hours.
Monday, April 7
Highways and Motor Day
11 a.m.—Dedication of automobile showroom, Aircraft Building, 212-213
Christmas Plaza, West to Lakeside

Tuesday, April 8
10 a.m.—Dedication of airplane showroom, Brook-Cadillac Hotel, 110-111
Christmas Plaza, West to Lakeside

Wednesday, April 9
10 a.m.—Dedication of airplane showroom, Brook-Cadillac Hotel, 110-111
Christmas Plaza, West to Lakeside

Thursday, April 10
10 a.m.—Dedication of airplane showroom, Brook-Cadillac Hotel, 110-111
Christmas Plaza, West to Lakeside

Friday, April 11
10 a.m.—Dedication of airplane showroom, Brook-Cadillac Hotel, 110-111
Christmas Plaza, West to Lakeside

Saturday, April 12
10 a.m.—Dedication of airplane showroom, Brook-Cadillac Hotel, 110-111
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Sunday, April 13
10 a.m.—Dedication of airplane showroom, Brook-Cadillac Hotel, 110-111
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Monday, April 14
10 a.m.—Dedication of airplane showroom, Brook-Cadillac Hotel, 110-111
Christmas Plaza, West to Lakeside

Tuesday, April 15
10 a.m.—Dedication of airplane showroom, Brook-Cadillac Hotel, 110-111
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Wednesday, April 16
10 a.m.—Dedication of airplane showroom, Brook-Cadillac Hotel, 110-111
Christmas Plaza, West to Lakeside

Thursday, April 17
10 a.m.—Dedication of airplane showroom, Brook-Cadillac Hotel, 110-111
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Friday, April 18
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Saturday, April 19
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Sunday, April 20
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Wednesday, April 23
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Friday, April 25
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Sunday, April 27
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Monday, April 28
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Tuesday, April 29
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Wednesday, April 30
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Thursday, May 1
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Friday, May 2
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Saturday, May 3
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THE Aircraft Market IN THE West

*An Informative Discussion of Past and Present
and the Prospects for Future Aircraft
West of the Great Divide*

By CHARLES F. McREYNOLDS
Pacific Coast Editor of Aviation

*Developments,
Sales*

SALES of any product follow the law which governs running water, in that the greatest volume will flow, either along the path of least resistance, or along the path of greatest population. To this law the sale of aircraft is no exception. The fact that more airplanes have been sold in California than in any other state of the union that takes on particular significance for the entire aviation industry. Either conditions are such in California that airplanes can be sold there more easily than in other portions of the country, or a better organized and more intensified sales effort has been made there, or possibly there has been a combination of both conditions. In any case there must be in this situation reasons of a vital nature for everyone interested in promoting the sale of aircraft. Therefore California deserves a special place in any general sales analysis of the aviation industry. Such an analysis should properly consider two separate phases of the western situation. First: What lessons are the rest of the industry able to study of what has so far been the world's best market for commercial airplanes? Second: In view of the past and present sales situation in California, what is the prospect for future sales in that territory?

Because the entire industry is now seeking markets far afield the first of the two points mentioned above

will be given primary consideration. The questions most frequently heard within the industry for the past six months have been: "Where is the aircraft market?", and "How big is the aircraft market?" Too often one has been given the impression that the answers of these questions were actually seeking a market for surplus stocks of airplanes or for inflated production, instead of making a sincere and scientific effort to determine how many of what sort of airplanes could be economically used where.

CALIFORNIA and the Southwest has been generally recognized as an ideal year-around flying country, in a section where business is carried in more nearly "as usual" the year around than in any other territory, and where "seasonal sales changes" are less felt in the aircraft market. Because of this continued selling season, and because the organized Spring flying and sailing season opens much earlier in the West, it is possible to "feed" the market trend considerably in advance of the rest of the country.

Bearing these facts in mind it is of real import to know that as late as March of this year California still shares, with the rest of the country, a sales slump of major importance. One of this state's leading distributors of aircraft, a company handling one of the most

popular planes on the market, in an extensive territory, has given bankruptcy since the first of the year. Another leading western distributor, with a well organized dealer group, and handling a line of popular planes completely covering the market, reports no new plane sales at all since November, 1937. Perhaps of equal significance is the fact that most of the small aircraft dealers have ceased to function as far as any organized sales effort is concerned. Also of interest is the announcement by a leading general company that it will undertake no further aircraft financing of any sort for an indefinite period. Other finance companies are handling aircraft on only the most conservative terms and the general situation is not one to stimulate volume airplane sales on the time payment plan.

Such a picture as that painted by the above sentences, if taken alone, would forecast a rather hopeless sales outlook for California, and for the entire country. However, there are other factors in evidence which give to a better conception of the true market possibilities, the gloomy reports mentioned above having served to indicate how real the aircraft sales slump has been in the active California market, and that up to the latter part of March there is no definite revival of new plane sales.

In sharp contrast to the dull market in new planes is the general report that used plane sales, at comparatively



View of Los Angeles Municipal Airport from the Observation Building

low prices, are very active. Both the Los Angeles (municipal), and the Los Angeles Metropolitan Airport, have reported quantity used plane sales recently, in addition to an awakening interest in new planes, extending only to demonstration flights. Edward L. Enderson, former used plane broker of Southern California, notes that his business during February of this year exceeded in volume any previous month. Various dealers report an encouraging interest in new planes among prospects who can afford to buy if convinced that they should purchase a new plane. These reports indicate that a normal seasonal interest is reviving, and of more importance, that a considerable volume of sales is developing where prices are sufficiently attractive. Other encouraging reports come from such factories as Black and Lockhead.

PERHAPS the most cheering news of all is that flying of all sorts in the West is on the up grade. Standard Flying Schools, Curtiss-Wright Flying Schools, and others in the Los Angeles area, Boeing School of Aeronautics, in Oakland, and other flying schools up and down the Pacific Coast report increasing student enrollments. General service operations, taxi work, crop dusting, survey flying and charter trips are all proceeding at a normal rate for this season, with the total volume of flying mounting rapidly. The major air lines are enjoying a steadily increasing volume of passengers, with T.A.E.-Blacklock, and Western Air Express operating at a constant average of 50 per cent of full load, or better. Since such activities are the backbone of the aviation industry and provide the major dependable market for aircraft, we may be fairly sure of continued progress in all elementary branches of aviation, no matter how the broad public market for airplanes may



Attracting coaches and excursionists to the air passenger in the West, a harbor and terminal building on the air. Airport at Burbank, Calif.

develop, or fail to develop. Certainly the general public is using the air mail, the air transport lines, and other air services in steadily increasing volume. We may, therefore, grant that aviation as a service has arrived and will never be suppressed, unless by some superior and gentler form of transit. Therefore all who build for and sell to the "service" portion of the industry, or what is known as our "internal" market, may rest assured that they have a permanent place in the industrial life of the country. It is that portion of the industry which has been building engines as a "commodity" and which has been trying to merchandise the airplane to the general public which must fight for its life during the next few months, and possibly years.

Returning to the article with which this article opened, that airplane sales, the running water, will follow the law of least resistance unless artificially restrained, we may analyze the California market which has absorbed per capita four times as many planes as the country at large. Sales naturally slowed to this territory in the beginning because the weather permits year-round flying, the great distances out here make a high percentage of flying economical for many uses and distances, because topography of this territory offers great obstacles to the development of surface transport systems. With this acceptance of the airplane came an almost simultaneous establishment of large airplane sales and service organizations. Sportsmen suggest we stop flying schools prospered, and in anticipation of continued use of aircraft sales many of the dealers started up heavily. The recent slump has rendered the industry in California and the West to the fact that when popular buying stopped, sales stopped. The sales and service facilities are as good as over. The artificial channels organized to handle a buying market are still in existence, but since the market situation has changed the aircraft distributing organizations have been virtually paralyzed.

As a matter of fact, the popular private market for aircraft has almost dried up in some areas. For example, it was until we have in the field strong groups, perhaps symbolized by the General Motors-Ford combination, which can afford to undergo a pioneering period, possibly extending into years. Naturally, it is not to be expected that all aircraft manufacturers with commercial ambitions must be backed by an wealthy and powerful group as General Motors. But it does seem essential that most builders and distributors of commercial aircraft be underwritten, either by a differing industrial activity, or by a military or aviation "back-up" financing group. It is in this type of activity that the greatest building up of the public market may be expected over a considerable length of time before any dividends may be expected back from such activities. Of course there will be exceptions to this general situation, and some companies of unusual merit and courage will probably continue through the lean years to the larger markets of the future, without any subsidies along the way.

FOR THE MOST PART, thought, the development of popular sales depends on the ability of the buyers to come close to zero. Artificial channels must be set up which will promote the direct flow of planes from the factory to the purchaser. This does not necessarily mean direct factory to purchaser selling, but it does mean direct analysis of all market problems by the manufacturer, design and production in types and quantities to satisfy

those markets, and distribution through channels sufficiently powerful to ensure that the right kind of aircraft will be marketed in the right amounts. Such a set-up again emphasizes the need for manufacturing groups powerful enough to conduct the necessary sales research, spend the money for specialized design and production, and allow sufficient distributor discounts to ensure satisfactory sales effort. Along with this program it will probably be essential to conduct a sound advertising program of major proportions. If the aviation business is not prepared to conduct such an effort, or is not able to do so, it is apparent that the industry will develop very slowly along strictly "trade" lines with the widespread adoption of the airplane by any considerable portion of the public definitely postponed until some future date. If the latter condition should develop, which is hardly to be anticipated, it is evident that distributing systems would be unnecessary and that all air field and schools would deal direct with the factory, handle their own servicing, as at present, and leaving the private owner to shift for himself.

If, on the other hand, the aviation industry is really going to organize itself for an effort to develop sales outside the industry it is evident that we must go out and create new markets. In this respect there are numerous examples at hand of market creation by the manufacturers and distributors of other products which were not initially accepted by the public and had to be intensively promoted.

WHERE it must be confessed that the airplane is perhaps more complex in design, manufacture, and marketing than some of the products of other industries, the basic problem of pioneering the market remains the same. Stated bluntly the developing of a popular airplane market is a job for the "big boys" and would probably last be left for them to handle at such a time as the prospects for net profits appeal sufficiently to them to warrant the effort and expense of a campaign. The rapid development of business aviation and the use of elementary air transport services indicates that the use for such a campaign is at hand. In the meantime the small manufacturer of aircraft will completely disappear except in special instances where a local economic condition, or an isolated case of personal genius, justifies his continued existence.

Some of the stronger units now active in the market are preparing for such an effort as has been outlined above. Some of the methods to be followed are indicated by certain California activities. Every effort must be made to force the expansion of the basic aviation industry through developing new applications for the airplane. One such is the suggestion of the airplane by a California mining company for transportation in connection with a mining project in Florida. Having found itself in possession of a valuable mining property some miles inland from the coast engineers reported that the cost of a road to the site of the proposed mine would be prohibitive. A study of the airplanes was made and it was found that by redesigning some of the mining machinery, and by properly selecting and equipping the planes for the job, that the mining operation could be economically conducted with airplanes as the only mode of transportation. This is but one example of specialized application of the plane to one branch of a great industry, among many great industries. It is fair to assume that if plane manufacturers would study the mining industry they could find many ways of serving

it. Specialized applications to other industries would call for a large number of planes annually and would usually be an increasing acceptance for the airplane as an indispensable cog in the world's industrial and commercial organization. An intensive study of the needs of all great industries such as power, mining, lumbering, oil production, cattle raising, ranching, banking, real estate, mining, petroleum, automobile, machinery, clothing, shoes, national chain stores and so on at great length, can hardly fail to yield many new outlets for the capabilities of aircraft.

IN DEVELOPING the aviation service industry California offers many examples of intensive application of the plane. Several amphibian planes have been placed in service operating between San Francisco near Los Angeles and water ports at Catalina Island, Halfway, Lake Arrowhead and other mountain resorts. A number of amphibians have been placed in service as ferry boats across Puget Sound, in Seattle, and across San Francisco Bay at San Francisco. These amphibian planes take off from and alight on the water, but lower their wheels and run up hard runways to a dry platform for loading and unloading passengers. Such services have proved of great value to the citizens, and offer a day example of the airplane applied when it can best display its own peculiar talents. There are other examples of special passenger and freight lines, which illustrate how every new and invaluable development of airplane service expands the internal market for airplanes and gains increased acceptance of the plane among business leaders and the public in general.

For the "private market" which the manufacturers must eventually develop we can only plead for a continued building of foundations and ground work upon which the future private market may be expanded. Aviation country clubs and organized flying by women are two activities which manufacturers may well welcome as an entering wedge to the private market. It is hardly necessary to point out that such an activity will provide a direct private market for private planes, and will do much to foster general acceptance of the airplane for private pleasure and sport flying.

Another phase of even greater significance is that of the flying club organized among the employees of companies engaged in aviation activities. Two examples of such clubs are found in the Shell Flying Club, organized among employees of the Shell Oil Company of

California, and the Kaiser Flying Club, organized by employees of the Kaiser Aircraft Co. of Alameda, Calif. Although this plan is not entirely new it has recently become more keen the attention which it deserves. Every person who is coming here and there through a continuous use of the aviation industry not only is personally interested in flying, but it is to his personal benefit to use it to that the first step in developing every airplane factory, every aircraft engine factory, every large operator or distributor of aircraft, and every large company intimately associated with aviation, such as the large oil and rubber concerns, would consider such flying clubs within their own organizations or at least set up outright a branch or an aviation flying club. These clubs would give their members an active outlet for their enthusiasm for aviation, and would result in a nucleus around which private flying could be expanded. Even so limited such clubs with only twenty members each, would give us two thousand private flyers who would be using aviation products, increasing the amount of flying being done, and selling the idea of private flying to all of their friends and acquaintances. Amusement concerns could well wish to make sacrifices in starting such clubs, furnishing materials at cost and arranging dancing for the operations, possibly through a direct salary key.

THE METHODS outlined above by which the internal market, the business market, and the private market might be expanded, constitute California's contribution to the program for improved merchandising methods. Of more vital importance is the major situation as indicated by conditions in the Southwest, which calls for fewer and stronger factories, finer and stronger distributors, a scientific campaign controlled by the manufacturers, with heavy financial backing, and the provision of a financial and industrial background of an independent nature for both manufacturing and distributing organizations. Finally, there are aviation markets now open and expansion of markets can be expected, but there is little probability of tremendous profits from aircraft manufacturing and sales for several years.

Reverting to the second phase of the Western market, as mentioned in the introduction to this discussion, we may well devote some attention to the possibilities for early sales in the California and Pacific Coast market, for as we have seen how the aviation industry may conduct its future operations, there are at present many airplanes yet unsold. Offhand, the California market might be considered a poor field for new plane sales in view of the high rate of ownership which was reached there as early as 1928. This view would be supported by the fact that used plane sales are still one of the mainstays of the industry, and also by the fact that more aerial sales were registered in California during 1926 than in 1929. However, there are two optimistic viewpoints to be considered. Replacement sales must continue at an active pace in a territory where large num-



Boating in winter water near Santa Ana, Calif.

bers of aircraft are being subjected to steady use. Also, the early saturation of the maintenance market has resulted in wide usage of the plane on the Pacific Coast, and due to the tardiness in the present market for every airplane properly used is eventually sold two more places. It is agreed in aviation as a substantial secondary market among persons are actually connected with the industry or who have not yet been so connected.

To set any definite figure as the future California market will be like trying to predict in advance the number of eggs that a hen might lay. The only logical reason is to study the bird's past performance, give her the proper attention, and let nature take its course.

Scanning the past performance of the Western and particularly the California market, we find available some significant data. Taking our figures from the United States Department of Commerce, Aeronautics Branch, and from the last United States Census report, we find that the eleven Mountain States, with a population representing 7.6 per cent of the total for continental United States has 18.7 per cent, or almost one-fifth of the registered aircraft, and that California alone has 17.4 per cent of all registered aircraft. To still further illustrate the manner in which the Pacific Coast market is concentrated it may be stated that 84.8 per cent of pilots registered in the 11 Western states are registered in the three Pacific Coast states of California, Oregon, and Washington, and that 66.2 per cent of the Western total, or approximately two-thirds, is located in the single state of California. Numbers of airplanes, if taken alone, would mean little. Figures on pilots and mechanics registered from the various states throw further light on the intensive nature of aviation in California. Of the total number of pilots registered to date, 10,213 according to the latest Department of Commerce bulletin, 2,670 or 26.3 per cent are located in California. This number is more than double the pilots registered in the next state, New York, which has a total of 1,007. Also of significance is the fact that the California state that doubles the number of pilots of all other states, also has the most transport pilots since the Federal State of California leads the next state by more than three to one. In mechanics housed California has 4,461 of a total of 7,628, or 58.1 per cent or approximately one-fifth of the various total and alone twice the figure for New York, the next best state, which lists 723 mechanics. When these figures are taken together it is evident that California not only has more planes, but with three times the number of transport pilots and twice the number of mechanics for a like number of planes registered in the next most active state, must be among those places most more intensive. This intensive use means more rapid replacement. For some idea of what this replacement market might be we may arbitrarily take the figure of three years as the useful life of a commercial plane. California has 1,232 planes registered as the product of their were worn out in the three years we should have an average yearly replacement of 407 airplanes. This is probably an optimistic figure, especially in view of the fact that a very large proportion of California planes are new built and will not be worn out for another five or six years, so that the replacement market may not develop as fully until 1931 or '34. However, the market for a good replacement market are so good that considerable attention may be given to such sales in this territory.

As to the market for new planes, considering that

there is such a market, even though limited, the fact that most buying of planes is still done by air through pilots, or upon their recommendation, may well be borne in mind. California, with double the number of pilots of any other state presents a concentrated market with twice the theoretical buying power of any other like portion of the country.

Considering the market from the standpoint of sales to the general public, which sales will depend upon the relative attentiveness of the persons in connecting territories, an analysis of Census figures again illustrates again that California, although eighth state in population has a total of more places than any other state, and has practically double the number of places of any other state excepting New York. On a per capita basis California has 2.12 times as many places per person as the next best state, Hawaii, 3.11 times as many as the most populous state, New York, 3.28 times as many as the average of the eight most populous states and 3.82 times as many places per person as the average for the entire United States. On this basis it would appear that the far western territory is approximately four times as well sold on the airplane as the country as a whole. Since there are 2,804,373 persons for every place in California it is evident that there is still room for improvement. However, accepting the proposition that the Western market is four times as active as the country as a whole it seems logical that four times the sales effort should be expended there in an attempt to take advantage of the evident willingness to accept the airplane.

So far as the machinery for this sales effort is concerned, there are two important phases to be considered. California is presently well organized for automobile travel and for air travel. There are large distributors of automotive products who might be added as the advantage to themselves of a close connection with a strong airplane manufacturer. Under such an arrangement there would be placed at the disposal of the aircraft sales program a thoroughly organized sales and service organization which could sell airplanes at retail or at a lower overland cost than can the independent distributor. This look-up with strong national interests has not yet been generally effected in this territory. For sales headquarters the terminal ports of the major airlines offer splendid facilities. Large airports, perfect airports and a complete staff for handling flight operations and the general public are all available at such places as Oakland Airport, Los Angeles Airport, Grand Central Air Terminal, Glendale, Union Airport, Burbank, Los Angeles Metropolitan Airport, Van Nuys, Chino Field, Santa Monica, El Segundo, Long Beach, Los Angeles, and other well established fields. Placing of the sales and service headquarters at such fields is a desirable move, rather than for the individual distributor to attempt to operate his own aerial service company, school, and charter business as a means of carrying the overhead incident to his sales work.

In conclusion, we may state that the trend of the market in the West indicates the continuance of a limited national market for practically all types of planes, with most sales to be made to the industry itself, and with the local market still on the rise. There is no indication of an early saturation of the present market, and the only hope for great expansion of markets is general less in extensive pioneering work by very large groups which can afford to sacrifice profits for several years to come while building for the future.

WHAT IS THE MATTER WITH OUR Advertising?

By JOHN HENRY KUNKEL
General Manager The King Company

THE QUESTION raised by the title of this article is not an unfamiliar one. These very words have been uttered verbatim by practically every executive of every company in every industry at some point or another during his career.

Since the aviation industry is beginning to advertise in a big way, it may not be amiss to ask this question of ourselves without applying it to the advertising of any one company in particular, but to aviation advertising as a whole.

The writer does not believe that the maximum sales value of advertising is being extracted by aviation companies whose advertising is appearing today. These companies are not good. Neither are they bad. They are lukewarm and therefore less than their faith.

A survey of our current campaign reveals a tendency in advertising for the sake of advertising rather than to advertise for sales. We are advertising because we are told it is a necessary evil or else because we feel it is the accepted thing to do.

This is not the fault of advertising managers. It is not the fault of advertising agencies. It is not the fault of the executives of airplane companies. The reason is found in the fact that the entire corpus of our aircraft companies have been concentrated on the problem of financing and developing production. Advertising has had to take second place. It had to curve in one way and go along as best it could.

The time has come, however, when this situation must change.

The aviation industry faces a major problem more difficult than financing and production. It must develop a market for airplanes to absorb the production we have so industriously developed in order to produce dividends.

so wisely stockholders whose money has made that production possible.

Advertising now becomes a delicate sales factor. It is the force which must be depended upon solely to create this needed market. It must pave the way for airplane salesmen. It must soften the hearts and open the purse strings of hard-bitten buyers who must be changed from their attitude from highly skeptical and swift, resistant to an attitude that is open and receptive. It must batter down all prepossessed negative ideas in the minds of prospective prospects, and replace them with ideas that are favorable.

ALTHOUGH advertising has been doing in generalities for the purpose of illustration, let's review the type of airplane advertising that has been appearing lately in leading business magazines. It has been issued, obviously, for the purpose of impressing the executives of leading industrial and commercial organizations in the purchase of airplanes and the application of the airplane to the furtherance of their respective industries.

In the role of many of these ads we have told our executive-readers something like this: "Year Sales Manager Can Travel From Chicago to Walla Walla in Less Time by Air." The copywriter picks up the script suggested in the title and proceeds to follow the theme. After the reader-executive has finished reading the advertisement he knows nothing more that he expected before he ever saw the advertisement. It knows he's in the market for it from point to point faster by air. The advertisement said less nothing. This suggests a solution to our problem.

Advertising must come to "advertise." It must Sell! Copy and sales are no longer dual in generality or

The well known adage about building a house—trap and living in the woods, may have held true in Emerson's day, but twentieth century business success requires not only quality goods but quality advertising.

In Mr. Kunkel's opinion aeronautical advertising is far below par, and in this article he relates its present ills, and of the important part that it can play in boosting aeronautical sales volume.

more conspicuous. Advertisements have begun to deal with *facts*!

In preparing our advertisements let us consider our audience. Aside for Christian purposes, let us consider the industrial-commercial market. Our audience is composed of executives. They have an interest in return. All seek ways and means of increasing the operating efficiency of their companies and thereby increasing their revenues.

The airplane manufacturer who first breaks an advertising campaign that shows its figures and its facts into the industrial and commercial sector of his plane are increasing efficiency and profits will accomplish much in preparing for his audience a fair, far larger market than he has to sell now.

To be specific, that campaign will show in a series of advertisements how an oil company is using airplanes to its profit. Another advertisement will show how a mining company has applied the airplane to its particular problem to the end that operating efficiency has been aided. Another advertisement in the series will tell how a Pacific Coast department store has begun to use the latest Puma Indians right from the steamer docks in New York and how these to the coast for display and advance sale before competitors were able to get them ready for retail shipment. One such advertisement will tell how a sales manager swung around the territory just before a big sales campaign broke, and through contact with his sales force was able to secure the whole-hearted co-operation of his selling force to the end that new sales were secured during the campaign that year before.

THE ABOVE THOUGHTS are mere suggestions of how certain commercial users may be applying the use of airplanes with profit. If aircraft manufacturers will dig in with their users the answers are they will secure enough facts to prepare a campaign that will prove the airplane profitable and efficient.

And in preparing such a campaign the advertiser should use actual fact and executive action. He should be specific. If Oscar Martin is the president of the Martin Valve Manufacturing Company and his company supplies the material for use of the advertisement, the ad should say, "Of course this is not the real name it will be applied on request!" That should cover right

out with the fact that the Martin Valve Manufacturing Company is using the advertiser's airplane and Oscar Martin, president of the company says that as use has produced a profit. He should play that up for all it is worth, and if it is done right it will be worth a great deal!

In the advertisement deals with how an oil company is using its plane, or fact of planes to the end that they have proved profitable then the plane manufacturer should lay that advertisement in illustrations in title, and in text to appeal to the executives of other oil companies who may read the ad. However, after that is done, the matter should not be permitted to rest there. If the airplane manufacturer has definitely proved that his product is a profit producer in some particular line of commercial or industrial endeavor, he should get the idea to other executives than those of the petroleum industry that because the airplane has proved a good investment for the "William Petroleum Corporation" it can prove an equally sound investment to other industries in other lines. Such suggestion in an advertisement should be strongly backed by the suggestion that the executive interested write to the manufacturer to find out how this can be done! Thus it is possible to open up a tremendously effective direct mail campaign upon the strength of correct publicizing advertising.

OF COURSE no manufacturer should expect his advertising to stand on its own feet, alone, but should back his advertising campaign with well directed sales efforts. When an advertisement, or series of advertisements, is dedicated to the use of the plane by oil companies on the sales department should back up this advertising with a strong drive on all oil companies, and similar or allied industries.

By co-ordinating dealer effort, heavy sales plans, and the general advertising campaign it is possible to extract the maximum advantage from advertising. If advertising is to sell, at this time when two-sided selling is so badly needed, then it must be substantiated and backed by a sales tool of the most powerful kind, rather than as the necessary evil which it has been so consistently considered by many up to the present time. Advertising is the most powerful of all sales methods, and it must be used intelligently as such.

STATISTICAL SOURCES FOR Market Analysis

Concerning Available Statistics and Their Value to Aero Sales

By FOWLER W. BARKER

Assistant Chief, Commerce Truck, the American Bureau of Statistics and Statistics Commission

THE MERCHANDISING PROBLEM before the aeronautic industry today is not merely that of turning buyers into sellers. In the past those who wanted to fly, and had the money, to accomplish different aircraft, spent a lot of time around airports, and simply bought the airplane their judgment dictated as best for their uses. The problem now is to find more persons who can be educated and developed up to the point of purchasing.

We have heard of numerous new and elaborate sales programs, but has the industry thought enough about market research? It is one that there have been numerous factual analyses of the aircraft market. Trade publications, national magazines of general scope, and advertising agencies have accomplished some comprehensive and worthwhile surveys. It is not believed, however, that these are being used to best advantage by sales managers in the aeronautic industry. Their thoughts are often confined largely to distribution, discounts, publicity-bearing flights, and colorful advertising.

Two classes of statistics are available to the aeronautic industry in analyzing its market. First, those dealing with aeronautics exclusively; and second, those dealing with general business and economic facts. The first class of data are being used, but, it is believed, not advantageously by the majority of sales managers. There are useful for purposes of determining the brief history of the market as well as its current condition. The second class of facts is useful in determining what action is taken is better to obtain future business.

Sales managers are busy with multifarious problems, and most of them shy away from statistical data. The surveys the sales manager has had directed to his attention by publications and advertising agencies have contained many interesting facts—but he cannot see how these will help sales volume. The data usually goes to the files for reference when the sales manager has time, but in most cases, he never looks there. It must be said for him that the surveys do not go in the wallet although they might just as well for all the good they do that it made of them. Other managers recognize the need for scientific market analyses. They have specialists for this work and find that it pays.

One first stands out in surveying the field of market

statistics, there are better data upon which to gauge the present and recent historical market for aircraft than there are for any other product. This was seen a broad statement but it is believed to be an absolute fact. What industry has facts so readily available to it as the following: names and addresses of purchasers; make and type of product purchased; year in which product was produced; length of time before distribution or delivery of a specific product; and names and addresses of persons at present qualified to make direct use of and to maintain the product?

The aeronautic industry has these data readily available in the form of the quarterly (considerable) and weekly (current) registration lists compiled and disseminated by the Washington Bureau of Aeronautical Chamber of Commerce from Aeronautics Board records. It is apparent from the large demand for the service that the industry is mine this valuable information. Its use must be believed to be for purposes of considering airplane orders, pilots and mechanics with sales propaganda. Other uses are being overlooked.

THE AERONAUTICAL CHAMBER OF COMMERCE is not obtaining from its members complete lists of distributors and dealers as it has been able to secure accurate figure of planes owned by private users may be suggested from those used by other types of operators. Air mail contractors are known. So are the schools and clubs, and, if not the more of the registered identities the operators for obtaining the aircraft is used. By elimination we can arrive at the figure for private owners. This is an obviously important factor and to date, although many attempts have been made, no one has taken the initiative to uncover this figure from the mass of data in which it is contained.

Thanks to "Ray" Cooper and the "Detroit Aviation Directory," published by the Detroit Bureau of that city, we have a list of distributors, dealers, and air service operators in Michigan. As a sample of what can be accomplished with the aircraft registration for Michigan—the Aeronautics Branch-Aeronautical Chamber of Commerce compilation for Jan. 15, 1930, in conjunction with Mr. Cooper's directory, we find the following:

Of the 474 listed and identified aircraft registered



As usually of billboard advertising of a construction automobile and airplane distribution.

in Michigan 204 or 47 per cent were privately owned; 71 or 15 per cent were in the hands of distributors and dealers; 45 or 12 per cent in the hands of manufacturers; 17 or about 4 per cent being used as scheduled air taxis; 21 or about 5 per cent by non-commercial and business organizations; and 41 or about 13 per cent by schools, clubs and other types of fixed base operations. The remaining 25 aircraft consisted of 21 gliders and 4 balloons which according to the state law must be given Federal identification numbers.

There are many other break down details which members of the industry can work out. For example, old war surplus aircraft can be segregated from others listed under "identified", the year of production is given so that one can break down the registration by the relative age of the planes.

There are believed to be very enlightening figures. The percentage of private sales is surprising, also the number of planes in the hands of distributors, dealers and manufacturers. That Michigan has more gliders and by non-commercial organizations than any transport operators is illustrating to say the least. It is difficult, of course, to equate aircraft as those "on hand" for sale by dealers and distributors and those being used by these organizations in their own operations. We have used the method of identifying by type, make and model, and could of course, if it was a Cessna, or of a make which the particular dealer or distributor is listed as representing. Personal experience with commercial aviation can determine with reasonable accuracy, from names of registrants and equipment registered, what type of operation is being conducted.

The quarterly cumulative lists of aircraft registrations could also be used in determining planes owned and in the hands of manufacturers, if the manufacturers would follow rigidly the policy of identifying aircraft with completed. There is no legal requirement in this connection. If the industry should agree on a policy of not withholding "identifications", there would be no this necessity as to its carryover or surplus.

We also have a list of distributors and dealers in Oregon obtained for this article by radio through the courtesy of James H. Barker, acting director of the Portland Office of the Bureau of Foreign and Domestic Commerce. This shows that of the 113 planes both licensed and identified, in Oregon on Jan. 15, 1938, 54 or 48 per cent were privately owned; 27 or 24 per cent in the hands of distributors and dealers; 4 or 4 per cent experimental licensed planes in the hands of manufacturers; 3 or 3 per cent being used on scheduled air taxis; 3 or 3 per cent by non-aviation business organizations; and 20 or 18 per cent by schools, clubs and other fixed base operations. The remaining 29 aircraft were gliders which have identification numbers.

Here is a state, principally agricultural, which with Michigan, an industrial state, is a representative market. Compare the breakdown for Oregon with that of Michigan. We find a smaller proportion of industrial planes, a slightly larger proportion of privately-owned planes and other valuable comparisons.

Using Oregon's weekly registrations as a test case on distributor and dealer turnover, the January 15 total registrations show 49 licensed aircraft and 64 identified. The January 25 weekly release shows no releases (because in connection with the C.O.R. no releases were made. As the Department of Commerce numbers of the planes do not change, regardless of changes in owner-

ship, that number on the January 15 cumulative list can be referred to for the purpose of determining who sold the plane. It was not a firm mentioned in our radio from Portland as the state distributor or in a local dealer for that matter. The owner of the new aircraft is not listed in the dealer and distributor compilation. As we cannot identify him as an operator for business, we can assume that he is a private user. Let us check his name on the pilot's list. Sure enough, he is down as a student pilot on the weekly list of January 18, 1938. We know conclusively that neither private owner because into the field. We know who sold him the plane. If we wanted to take the trouble we could trace that plane back to the time it got into the hands of the last seller, but it is a 1932 model so we will not bother. The plane may have changed hands several times. If we do not we can trace it back so far as when the factory had it first identified. We could also find out how long it remained on the manufacturer's hands before he let it out presently on a bona fide sale.

Many facts can be worked out from these worthwhile lists. They are being improved. Since January 28 new plane licenses are indicated by asterisks. The January 18 issue, by the way, includes data taken into consideration on the January 15 cumulative list. We have been told by Paul Bratton head of the Washington Bureau of the Aeronautics Commerce that the cumulative lists are brought up-to-date quarterly. ("Licensed Mechanics," "Licensed and Identified Aircraft" and "Licensed Pilot") being released on alternate months, the last issue being December 15, January 15, and February 15, respectively. The weekly lists containing current registrations of aircraft, pilots, mechanics are dated and released on Saturday of each week. Accordingly, additions and changes for aircraft on the list of "Aircraft, Pilots and Mechanics Licensed" during the week of January 18, are covered by the January 15th cumulative list.

Essentially, the Aeronautics Chamber deserves a great amount of credit for making available to its industry the most complete and valuable data to be had by any group in any industry. The Aeronautics Branch can be used without restriction by the American Aeronautics Trade Division, although cooperating closely with that branch of the Commerce Department is not a part of it; this division being under the Bureau of Foreign and Domestic Commerce) deserves credit and a large amount of an broadening of the market to the industry to be simple and disseminate the facts from its records. Formerly several publications compiled these data independently and some discrepancies occurred in their respective releases with resulting confusion. The Aeronautics Chamber of Commerce goes out the information quickly. It is available to anyone. Should the Aeronautics Branch endeavor to handle the job itself it would require a special appropriation and unavoidable delay in printing.

Another improvement in the service is that starting with the weekly list for the week ending February 8 the names of the immediate former owners of previously identified aircraft are included. This provides the necessity of looking up the name in the cumulative list as was necessary in the aforementioned test case. There are several supplemental services in connection with these reports. The weekly release of aircraft registrations starting with January 31 year breaks the aircraft figures down by sales of planes, by states, in a manner

similar to the same services "break down" of automobile registrations. As some manufacturers have different types of planes i.e., open biplanes and cabin monoplane, this compilation, if further broken down by types, would be of greater value. The Aeronautics Chamber has also compiled an ungrouped form a "break down" of licensed aircraft by types, by states, as of Jan. 15, 1938. Now what we need, and what the Chamber is going to make available, is one showing type of purchaser for the whole country as has been done here for Michigan and Oregon.

Some individual users need runs along statistical lines will develop a simple system for compiling and breaking down these valuable data to give one who is selling aircraft everything he would like to have from them at his finger tips. The basic data is available. The resulting work should be simple and not too scientific or complicated.

Now as to the second class of statistics. The first as stated before deals solely with aviation. We have mentioned the most valuable. What can be done about selling more of the layman and not waiting effort on those who are already sold? We turn again to dry old statistics for guidance and there are volumes of them. Fortunately someone has pored over these and compiled in one volume some of the most pertinent figures for the market analyst no matter what line of merchandise he is interested in selling.

IT IS REMEMBERED of an assembly that practically no aeronautics sales managers or, in fact, few individuals in the industry have taken the trouble to survey the "Market Data Handbook of the United States." Upon its release from the Government Printing Office last fall, it was specially directed to the attention of the aviation industry by the Aeronautics Trade Division through the local offices of this Bureau. To our knowledge, not more than one or two books have been sold in this country, which may perhaps mean more merchandising study than any other.

The Department of Commerce is not in the business of selling books, and, in fact, it is unnecessary to buy one as it may be referred to at any of the 26 district offices of the Bureau located throughout the country. This work is believed to be of value in gauging the future aeronautics market, in determining where to place advertising, in the better allocation, as opposed to the haphazard highway allocation, of distributor and dealer territories; and in establishing sales quotas. One who is selling automobiles, for instance, will find support of value of production, are taking advantage of the data contained in this Handbook, as demonstrated by the fact that it is now in its third edition, two of them of 3,000 copies each having been completely exhausted within two months of initial release. The author, Paul W. Stewart, of the Department of Commerce worked for two years, with a staff of assistants and with the cooperation of various national advertising agencies in preparing it. As a result he was recently with the author for the week ending February 8 the names of the immediate former owners of previously identified aircraft are included. This provides the necessity of looking up the name in the cumulative list as was necessary in the aforementioned test case. There are several supplemental services in connection with these reports. The weekly release of aircraft registrations starting with January 31 year breaks the aircraft figures down by sales of planes, by states, in a manner

With regard to the Handbook there are three general types of statistics considered: the general consumer, the industrial and the farm—all very definitely fitting into the aeronautics picture, although the last mentioned is somewhat less in importance by our industry. The 3,000 copies of the United States are on order as well as purposes of market measurement. Few trading agen-

cies are included as supplements to the Handbook, two of which present both the wholesale and retail angles of distribution. One map covering operating territories delineates 30 major trading areas which are subdivided in some instances into secondary areas making 187 for the entire country. The 50 major trading areas, which do not take state boundaries into consideration but rather economic divisions, may be used as distributor or factory branch territories and the smaller ones for subdistributors and dealers.

This largely statistical work contains the following data, by state with break down by counties, all of which have a direct application to the market for aeronautics products: Population (urban, rural and number of families); value of agricultural production; value of mining; bank deposits (with savings separate from checking); postal receipts; manufacturing and sales returns; passenger automobiles; added circulation of 15 national magazines, and various classes of newspapers; and number of trade outlets, retail and wholesale.

THE HANDBOOK applies to the consumer market, in other words the "private owner." We can imagine the aeronautics salesman or his boss asking, "What practical use can be made of this mass of data?" Really, they tell him where the people are in the country who have the money to purchase aircraft. The volume manager, if he already has a distributor in a territory who is doing up well in light of these statistics, can tell the latter a lot about the territory that the representative does not know, and why more sales should be made. If there is no representative in the particular territory steps should be taken to obtain one.

A table in the book showing the production of the various flying groups in the country would ordinarily be passed over without thought. It should draw attention to a new market, i.e., aircraft for the transportation of fish inland. The industrial and farm markets are covered also, so far as an index is concerned, in the manner outlined by the consumer trade. The Handbook also contains a bibliography on market research. Some of the publications listed contain specific guidance in determining sales quotas, some attempt to apply practically the theory of market analysis, and others are purely statistical.

There are of course other statistics of value in aircraft market analysis which because of limited space cannot be mentioned in this article. When the 1938 edition is completed a break down of population between 16 and 45 years of age may be data of value. A percentage of perhaps 15 per cent for those not physically qualified to fly, the number of potential pilots to fly privately owned aircraft. One heretofore unpublished but recently uncovered by the Aeronautics Trade Division may be taken as an indication that the industry, although criticized for overproducing and for low unit production methods, has something favorable to be said for it. According to the National Automobile Chamber of Commerce last 3,081 passenger automobiles valued at over \$4,000 were produced in United States factories during 1937. In the same year 6,014 aircraft at an average valuation of well over \$5,000 were produced. By scientific instead of haphazard sales methods, based upon thorough analysis of the market, the industry should reach out and develop the three classes of potential customers—individual, industrial—and, do not overlook, the agricultural.

THE Parts Distributor AND HIS DEALERS

By EDWIN G. THOMPSON
President, Thompson Aeronautical Corporation



Edwin G. Thompson

THESE IS an old axiom which states: "A chain is as strong as its weakest link." Since there is such a close integrity of purpose between the manufacturer, distributor and dealer, it may justly be said that a manufacturer is no stronger than his weakest distributor, and that the latter is no stronger than his weakest dealer. Thus, the success of such depends upon the success of all. Therefore, it behooves the manufacturer to make his distributor organization as strong as possible, and the distributor to exert every effort to keep his dealer on-top of the highest calibre.

Because of their common interest and notwithstanding the fact that the purpose of this article is to deal primarily with the able distributors of aircraft engine and parts should give their dealers, it might be well to outline briefly here the help manufacturers of such products should give their distributors.

It is generally acknowledged that the manufacturer has a more profound knowledge of his product than any of his distributors. This is due to the fact that the latter may be acting as the mere capacity for a number of various firms. Consequently, it is more important that the manufacturer bend every effort to see that his distributor and their salesmen possess an thorough knowledge of his product as possible.

The manufacturer should, in many cases, train his distributors' salesmen. If an engine builder, he should maintain a school, or be able to provide mechanics skilled in the methods of servicing his products. In cases that his engines are properly protected by adequate service facilities. He should supervise or provide his distributor's advertising, and it is part of his duty to perform in a general way the more specific duties of the distributors.

Now we come to the function of a distributor as regards to the aids he should give his dealers. It is difficult to differentiate between the importance of the numerous functions of a distributor, but perhaps his most essential duty is keeping his dealers informed of new developments in the products they are handling.

We believe that the most far reaching task a dealer's counterpart of new developments and improvements is one of the distributor's most important functions because of the countless product changes and refinements that are being made from day to day, by aero manufacturers.

Many aircraft engine manufacturers have found that, no matter how many "legs" they are able to discover and eliminate through black-and-white test flights, there are always countless others which are not found until the

engines have been placed in production and are giving actual service on air lines and planes. Also, because competition in the engine field is extremely keen at present, all manufacturers are constantly working to perfect their engines. Thus, it can be seen that as engine which is apparently in its ultimate form today may, a month from now, be lacking in some of the refinements contained in an engine of the same type, which came off the same assembly at a later date.

JUST RECENTLY one company received notice from the engine office of an engine builder, for whom we are distributor, stating that they had developed an important part for the reduction of one of their engines. This type of power plant has been in production and delivering daily service on many planes throughout the country for over a year. Yet the manufacturer requested that we have this change made on all engines of this particular type that were with our shops or those of our dealers for overhaul, in the future.

This is just one of many similar instances. In each case it is essential, of course, that we acquire an adequate supply of the new parts, after their dealers immediately of the replacement and are that they, too, stock up on these parts.

Very often the manufacturer may develop new tools to facilitate the servicing and overhauling of his engines.

Or the distributor, in his own shops, may work out more efficient tools or methods for performing various jobs. Such knowledge and aids should be given to the dealers as promptly as possible.

Following are a few suggestions among the aids a distributor should give his dealer are overhauling helps and suggestions. In the aviation industry, the outlet for such products as airplane engines and parts is not of sufficient volume to permit the distributor to function with overhauling analogous to distributors for similar products in other industries. Consequently, the distributors' inventories are high, the sales are slow, and the turnover low. The distributor who turns his inventory over twice a year, assuming he maintains a sufficient stock to serve his territory, may be said to be doing an excellent business. However, to operate on a more economic basis and remove a return from his investment commensurate with that of other lines which he might handle, the distributor should be enabled to turn his stock over four or five times a year.

A recent discount on accessories, supplies and engine parts are too small. These rates are set by the manufacturer in most instances. The reason for the small rates revolves around the old economic principle of supply and demand.

The solution to the problem of small turnover and low discount rate is, of course, to create a larger sales volume through a well-organized distributor and dealer organization. However, during this period through which we are passing, with discount rates lower than those in other industries, the responsibility of correcting this condition lies with the manufacturer.

Notwithstanding the above mentioned fact it is up to the

No matter how fine the quality of his product may be the progressive aircraft engine manufacturer should establish a parts and service organization so that his customers may be assured of maximum value for money expended. The keystones of such an organization are the distributors. They are responsible to the manufacturer for the activities of the dealers, and it is the dealer who actually contacts the man who originally placed his signature on the dotted line of the manufacturer's sales contract. In the accompanying article Mr. Thompson discusses from an authoritative point of view, the responsibilities of the parts distributor and the various methods to be followed in building up a profitable dealer organization.

the distributor to do what he can to build sales and endeavor to show the manufacturer that the condition should be remedied. It is necessary, too, that he give his dealers all the assistance they require in selling their service and parts.

The distributor's salesmen should work with his dealer's salesmen. The former should accompany the latter on various calls whenever the occasion warrants. Through



The sales counter of a parts distributor's shop. Note ease of display of parts.

this system the distributor may observe and correct the sales methods of his dealer. By this procedure, too, he can help select the real prospect and sell them perhaps more thoroughly than would otherwise be possible.

THE AGENC PROPOSITION is extremely complex because of the scattered and limited registrations of prospective customers. This condition will hold true until the American public, as a whole, become air-minded to the extent that they adopt the airplane to their business or personal use. In the meantime it is quite important that a sales and educational campaign be carried on in the same time. And sales and educational programs can be best carried out by the personal contact work of salesmen which is now bolstered up by advertising aids.

We have found in our own company that a properly motivated direct mail campaign is the best type of advertising for selling service and parts, although it is tied in with trade journal advertising. Our priority for direct mail advertising is due to the fact that, as in the case with most distributors and dealers, the territory we serve is limited. Because of this there are few if any salesmen which offer a complete coverage of our market without a great waste. Therefore, the logical type of advertising for a dealer is direct mail. And, inasmuch as few dealers are equipped to prepare such literature, it is the duty of the distributor to assume or supervise this work.

As has been mentioned before, we do our direct mail advertising in our advertisements in several of the better trade magazines. This latter type of advertising, while essential in one case, is undoubtedly too expensive for the smaller dealer. However, in instances where the dealer is going after a large transient business, he must use such mediums. In all instances the distributor, when not assisting in the preparation of the copy, should have the right and, in fact, make it a point to supervise all of the dealer's advertising. This is merely in line with the general procedure followed by most manufacturers in classifying the type and kind of advertising which the distributor should employ.

Now we come to the duty of the distributor in the matter of fulfilling his functions as a source of supply for his dealers. Theoretically, the distributor occupies the same position in relation to a manufacturer as a

factory branch and, as such, he should be properly located geographically to best serve his dealers. He should be situated as near the center of his territory as possible or should have a complete network of stock at such a point. Only in this way can he give his dealers the prompt and speedy delivery they often demand.

Also, in appointing his dealers, the distributor should endeavor to have them located at the most strategic points geographically in order that they, too, will be in the best possible position to serve the widely scattered owners and operators. In other words, the dealer, whose duty it is to function as a branch of the distributor's service, should make these facilities available to the individual owner and operator no matter where he may be.

The majority of owners of airplanes are scattered in small home ports over a wide territory. Consequently, it is necessary for the distributor to have a well planned, properly laid out dealer's organization, to render satisfactory service.

THIS BRINGS us to the question of stock. We have just stated that a distributor should be centrally located in his territory to expedite deliveries. For this same reason he should carry on hand at all times a full complement of parts and supplies to supplement the stock the dealers are required to maintain.

It is not only a question of selling the dealer his initial order of stock, but it is equally important that he be given help in keeping his stock properly inventoried in order that he may in turn render proper service to his territory. In many instances it is advisable for the distributor to stock his dealer in setting up a service, or some other system whereby they can keep an accurate check on their stock.

It is essential, too, that the distributor give every available aid in keeping his dealers' stock of parts for obsolete, or near-obsolete engines at low as possible so that they will not find themselves with large stocks and up in undesirable parts on their hands. To this end the distributor must be able to give technical advice and assistance. The problem also goes back to the need for keeping dealers informed of all new developments and refinements which we previously mentioned.

From the points we have outlined, it is clearly apparent that a distributor must be a specialized and a jack-of-all-trades at the same time.

While not operating directly with the customer, his service more directly through his dealer organization, he must have a basic knowledge of the dealer's problems from every angle. He must have an authoritative knowledge of engine overhaul which will enable him to render expert technical advice whenever called upon. He must be in a position to give merchandising help and suggestions. He should be able to assist in formulating efficient inventory and stock accounting systems. And he should be capable and ready at all times to supplement his dealer's service and render any aid necessary.

MERCHANDISING BEGINS IN



THE Drafting Room

By JOHN F. HARDECKER

When, and consider it is the right of how anyone—anywhere—ought operate and service it. It isn't enough to feel that to do a certain thing or not to do it isn't anyone's business, his job to make the doing of the right thing easy, and the wrong thing impossible.

This implies immediately a more intimate study of materials and tolerances. Case of machining in the shop is seriously a point in favor of any given material, but when that machining comes with it a consequent wear on the softer material in operation that hastens replacement, then it is no longer an advantage from the true merchandising angle. Weight saving is of primary consideration, but if light alloy fasteners will not stand up as well as the copper base in actual power plant operation, then the weight saving must be logically foregone. Standard bolts are a distinct advantage, but if they introduce play in a large point which breeds excessive wear, then special close tolerance bolts are a true merchandising necessity. And bearing control policies obviously cost more, but if they introduce operational ease and greater life, the designer should spend them regardless.

When an organization buys in sufficiently large quantities, and many aviation activities are rapidly approaching that position, special materials or special variations are

At first glance the title of this article might appear to be a bit far-fetched. Yet, as Mr. Hardecker points out . . . "there is a tangible relationship, and many a real merchandising problem is unwittingly born on the drafting board." To support

of his opinions Mr. Hardecker writes of several merchandising "errors" that can be traced to the drafting board. Individually, they are of no consequence whatsoever, but collectively they can very easily prove to be a most serious hindrance.



A view of the parts stock room in a service station

readily obtainable. Many times such specifications possess almost technical advantages and many times also the advantages are purely traditional. It is well to thoroughly examine all such special material specifications, for while they may possess what at first appears to be highly desirable selling points, the operator who is down to an isolated section of the country can do nothing for such refinements. He'll replace with whatever "looks like" the material in question from the nearest commercial source. And if he can't—well, there goes a black mark against that manufacturer.

A great deal can be gained by studying the commercial practice of the industry in which the material or part originates. It is easy to obtain special grades of metals, or even for ordinary commercial goods to fall within the tolerances of the special specified grades, but who complies the replacement problem unsatisfactorily? Machine products may be brought to almost any degree, but only ordinary special parts of ordinary commercial parts will do. These same obvious points, but it is surprising how often their common sense is violated, for aviation deals with many materials and parts from many industries.

To call for current standard parts wherever applicable is such an obvious advantage in merchandising and selling, that it seems almost insulting to mention it. At least the advantages are too obvious to bear repetition. Yet, there is still a prominent airplane manufacturer who buys his bolts and nuts to the old Army standard part numbers, although AN bolts and nuts have been available for over five years. Then there persisted for a long time the airplane manufacturers who used special terminal connections on their streamline wires, so that replacements could not be made with standard AN terminals, and special ones had to be purchased or manufactured. Special parts founded on sound engineering judgment are occasionally necessary in place of some obvious standard parts, but in the vast majority of cases they are founded on some special prejudice or inhibition of the engineer. The real back-back occurs when the business operator is urged to manufacture extra to what he believes are requirements of the per-

sonal engineer or draftsman, and real merchandising and selling effort is inhibited thereby.

THE MATTER of part numbering drawings appears such a simple one, that seldom are the dangers to such merchandising and servicing policies that lurk therein even suspected. Part numbers in the abstract are cheap, being really free for the asking of the record clerk, and so are often little respected in the drafting room. There is, for example, the engine manufacturing organization which in forwarding complete detail drawings for each model, completely drops such separate men and assigns a new part number, so that in the memory of various model assemblies, the same little insignificant commercial extra pin may be camouflaged under five different part numbers. Think of the strangle of the poor stockkeeper who is always making such enlightening discoveries, and wondering whether he can really trust his own observations. Consider his reactions when an excited service man enters his storehouse and pulls out the required part from a bin bearing a totally different part number.

Then there is the matter of changes on drawings and their effect on part numbers. Some manufacturers change part numbers rather generally—the more an significant change breeds a new part number for the price in question, others never change a part number, even though all interchangeability is lost or the change is mandatory due to actual failure in the original part. Sound engineering policy would appear to indicate that when changes are minor and interchangeability is unaffected, that part numbers should remain unchanged for easy identification and utilization of replacement parts on hand, where the change is mandatory a new part number will save endless confusion.

Ease of accessibility for service and repair incorporated into the design in the drafting room, is reputation insurance for the manufacturer. After all, repeat orders are the most satisfactory and gratifying source of profit in any business, and making it easy to keep part products in good order and operation, is self protection and self help. Too often a part requiring frequent inspection is made inaccessible, or fabrication

points are so unobtainable and well hidden, that they encourage neglect.

The foregoing are not points which are brought forth as criticisms of those charged with engineering policies. Obviously, craft designers would find little encouragement from minor excursions, who have the merchandising and servicing problem very much at heart. They are rather detail points often decided by detail draftsmen or minor engineers, which never merit excessive attention in the light of their present presentation. Individually, the harm of single mistakes may well be evaluated as zero, but collectively, they total a serious and often unacknowledged obstacle to successful merchandising.

SELLING *Air Passenger*

TRANSPORTATION

A Review of Air Transport's Growth and What It Will Offer the Traveling Public Tomorrow



By J. M. EATON
General Traffic Manager,
Pan American Airways, Inc.

THAT there is interest in the development of aviation cannot be questioned. The spread of interest covers the cautious, the younger boys and girls from six up, the aviation seeker, the commercial traveler, the banker, the skilled labor, the college man anxious for opportunity, the post office, the public in general and the traveling public who sees transportation as a means to an end, anxious to reach destination with the least delay. The seasoned business man or woman realizes that any new industry must go through its "growing pains" during which time there will be periods winking between uncertainty and expansion, but sooner or later they are going to expect

the laws of gravity. It was born in about 1800 when Leonardo da Vinci, that great artist and sculptor, architect and engineer as well as scientist, thought through and study of aerodynamics, advanced theories which convinced him of the feasibility to design and keep in the air a body heavier than the atmosphere. It was an infant named by Montgolfier Brothers, de Navier, Professor Charles, Camille, Le Bris, Lilienthal, Professor Langley, Dornier. The child was made to take a step in 1903 by Wright Brothers, and since that time has crept, taken many steps, walked, sprinted, and quaffed on the track team. Contributions to advancement were made in rapid succession by men now famous in aviation up to the point where a diploma was awarded when Col. Charles A. Lindbergh set the world on fire in May 1927.

We now come face to face with the man—"Aviation"—who must select a position and determine what success he will follow in making it a success. Based on the knowledge which he has accumulated during the great number of years since his conception and the wonderful

Wright's first manned airplane in its full Pan American Airways



General view of a modern aircraft factory showing parts

opportunity of using which handicappers discovered among wheels, belts, screws, electricity and gasoline engines developed, he needs no one to remind him that in order to be successful he must prove his worth by merit and not depend on that so-called "safety cap appeal," which is a misused covey expression meaning an attraction based on a quick passing fancy procured by sympathy or a shallow, romantic appeal toward an individual effort satisfying a temporary desire. He knows that merit is based on dependability, regularity, constant attractiveness, safety, economic value and financial responsibility.

He has chosen transportation as his vocation and has adapted merit as the keynote of his policy in handling passengers, mail and express.

Most of us know what the tramp steamer is, or perhaps a better example, what the jitneys are or were. However, only few realized what the jumbo was when they first appeared on our streets. It took him a few and months to show that they were not a dependable method of transportation and slowly a lot of individually owned automobiles put into operation under a policy which was based on a romantic appeal and was misused. Aviation started off during its immature period as the jumbo and relied on the occasional thrill, given appeal which was quick passing, then asked for sympathy based on a romantic appeal of certain individual effort with the result that a premature situation was created. It most now apply the following formula to itself:

1. Is there a need for fast transportation?
2. Will air transportation function with or surpass other forms of transportation?
3. Is it best adapted for short haul or long haul?
4. Is it able to stand intensive competition from other fees of transportation, or will it best flourish where other transportation is not highly developed?
5. Will it develop new travel or will it simply divert business from other lines?
6. What is it adapted for—amusement, business, or both?

The answer is, there is need for fast transportation; that the air offers the best medium; that best results can be obtained over the longer distances (at least for the present where airports are located so far from the center of population and where short distances are served with fast established ground transportation); that the greater percentage of revenue will be diverted from other lines for the next five years in that it will be used primarily for business travel in this country and more recreation flying equipment is developed (Europe and a few spots in this country being the exception where actual tourist travel takes it up for one reason or another).

AIR TRANSPORTATION is just like any other business in that it is dependent on its sales for its revenue and is the one with the manufacturer of radio, electric refrigerator, candy, cigarettes, etc., except that it is a service instead of a physical commodity, and requires a greater combination of details. The thing to be sold is intangible, something you can't take home with you, only a remembrance of something you found useful when you wanted it and expect that it will be the same or better when you want it. Therefore you take no particular pride in (because it's not yours), something you can be tremendously proud of if it doesn't please, some-

thing that is dependent on reputation and good will for its continuance—in other words, it's a frame of mind; psychology has a big part to play in the success of ground transportation and is going to play even a bigger part in the selling of air travel. The company, or companies, that allow the mere mechanical phases of the aerial transportation business to go beyond their function of economic safe operation and fail to build their policy on the vast fact of a scientific knowledge of human psychology may die out an existence but will never be a success. In other words, the sales start out with the clerk at a ticket window, or behind a counter, or the salesman who may call at your office or the sales and advertising staff, but back into the selection and length of routes, the hour and frequency of schedules, the use and choice of equipment, the arrangements, the comfort and the appearance of the interior, the location and the architecture of ground facilities, the co-ordinating of land agreements with other forms of transportation, and the opportunity to be constructively critical of the manner in which operations are conducted after the system is in operation.

Travelers are interested in comfortable, attractive, safe, dependable handling at a price that is within their reach, not beyond what they can spend. But it has been proven that they will stretch their limit if they are pleased and they are perfectly willing that a company which is giving a service be allowed to make money; but have a Twentieth Century and which expects multiple production, low costs and maximum value.

THIS sets air transportation free to face with the necessity for bigger planes—planes of fifty to a hundred or more passengers—planes with not only seats to accommodate its passengers but additional space effectively laid out for sleeping, smoking, refreshments and other amenities. Is there any reason to believe, providing comfort, speed, safety and regularity are available at a reasonable rate, why fail at a hundred passengers will not leave by air—Boston or New York for Chicago—or Los Angeles or San Francisco for New York—or Central Station for Central and South America—or a short haul like New York to Boston—when we have steamships and railroad trains carrying two hundred to two thousand passengers daily? With these larger units, costs per passenger could be so reduced that rates could be dropped to the scale of ground or water transportation and the operating companies would be in a position to enjoy profits.

At the present time, equipment has reached a point of development where, with proper maintenance, it can be trained 100 per cent for the purposes for which it was designed as given by the nature of scheduled air traffic. It has been handicapped by small capacity planes but great strides are now being made in commercial planes and some of the lines will, within the next year, have in operation planes of 32, 35, 41 and 49 passenger capacity. These are but the development of the still bigger and more complicated planes.

Wonderful assistance has been given by the United States Post Office Department to the development of the use of the air throughout the United States and Latin America, and during the last two years passenger travel has been developed to a point that more than 155,000 passengers traveled by air in the Western Hemisphere.

The man "Aviation"—his big feet on the ground, his nose is good, his eye is on the ball and his swing has the right follow through.

DEVELOPING THE Foreign Aircraft Market



By LEIGHTON W. ROGERS

Chief, Aeronautics Trade Division
Bureau of Foreign and Domestic Commerce

EXPORTS of aircraft, engines, parts and accessories from producing countries have increased rapidly during recent years, although unbalanced shipments of these products are small in comparison with those of other items of transportation equipment. Figures just available for 1939 show an almost threefold increase in aircraft exports over the year preceding. Because of the diversified uses of aircraft in the United States, it would appear that this country is peculiarly fitted to supply the world market.

This does not mean that all American aircraft manufacturing companies should try the export market. These are producers built up by experience which no competitor would care to be in a position to adapt. Do not "dabble" with export trade. Do no rush into it one year because business is bad at home and ease off or abandon it when domestic business picks up. Unless you have the time to give it executive attention, the money to enable you to work on a done to flow your program, and an approved product it is far better not to enter export trade at all. This does not mean that only the large companies or groups strong enough to have separate export organizations may be successful, as experience in the automobile field has shown that some of the most successful American cars in export trade are not especially important in the domestic field, nor are the companies manufacturing them. The companies have simply concentrated on building up export trade over a period of years.

Many export departments and companies have failed in other media because too active export matters have been turned over to clerical or minor executive assistance. This is folly. The problems of exporting are special and they require the best possible executive ability. One of the most successful mail order experts in the United States attributes the success in exports of the company of which he is president to the fact that his product is the best that can be made for the money, that he person-

To some manufacturers the development of a foreign market would mean more profit and a business line over during periods of domestic sales slumps. To other manufacturers the development of a market across the seas would be but a waste of money and energy. As Mr. Rogers points out in this most interesting and informative article, export business should be regarded as more than just a side line to be taken up or dropped at will. It is a good source of business revenue that requires just as much executive skill as the domestic business. We sincerely advise every manufacturer to give serious consideration to what Mr. Rogers writes here about the requirements and methods of procedure in conducting a successful aeronautical export business.

ally gives much of his time to the export phase of the business, and that the factory has explicit instructions to give export orders preference. Over a period of five years, this company has built up an export trade which brings a solid, comparatively non-fluctuating income to its business which carries its thought whatever

ten years occur in its large domestic market. This is the type of executive practice which aircraft exporters can follow with profit.

The Department of Commerce is prepared to render assistance to companies desiring to develop export trade in approved products along sound lines.

One of the major functions of the American Trade Division is to point the way to American manufacturers of airplanes and related products toward successful exporting. The district and cooperative offices of the Bureau of Foreign and Domestic Commerce of the Department of Commerce are placed at important centers so that exporters and potential exporters may have questions answered which might arise in any phase of their export trade. Files are maintained in the office enabling their staffs to anticipate some of these questions and render services automatically available to aerospace firms listed on the Bureau's export list. The names of prospective importers and dealers of aircraft engines, parts and accessories, memoranda of opportunity for the sale of such equipment and data on market conditions are made available only to bona fide United States firms (with at least \$1 per cent of capital controlled by citizens of the United States). The export list contains, besides manufacturers or exporting firms to this complete service, may be assigned upon application to the appropriate district or cooperative office.

The Aeronautics Trade Division has received a very considerable degree of cooperation from the 63 foreign offices of the Bureau located in strategic points throughout the world for the specific purpose of aiding American manufacturers to market their products, as well as Vice Consuls of the Department of State. It is the function of the Division to coordinate the aeronautics trade promotion work of the various foreign and domestic offices and to give advice to the interested aerospace

firms. Also basic and current market data are obtained and disseminated which will enable those interested, whether or not experienced in export, to have a complete and accurate picture of the elements, both favorable and unfavorable, against the exportation of United States aerospace equipment.

The district and cooperative offices will be glad to answer all questions possible and pass on specific inquiries to the Aeronautics Trade Division, which for any reason, cannot be replied to locally. For purposes of expediting the service, it is suggested that the appropriate domestic offices be contacted rather than the Division direct.

Some airplane and aerospace product manufacturers have been found to be wary of foreign business, having obtained the impression that exporting is fraught with mystery. They think of import duties, foundation sites and from foreign language coming for some shipment, consular formalities, methods of payment, etc., as insurmountable barriers to successful exporting. These problems can be quite simple when the industry knows where it may go for information and advice. In this connection the Division is not nor does it claim to be an infallible source for everything that the potential exporters may require. It can, however, with the facilities at its disposal, render a unique service, satisfactory only as a clearing house of information available from outside sources.

It follows rigorously the policy of not duplicating services rendered by others. No matter how foolish a question may be in the mind of a member of the aerospace industry, the Division should like to be called on and will return a courteous and prompt reply.

It has been directed to the attention of the Division by foreign individuals and firms of questionable financial standing and integrity that they inquire, not even by cable, for specifications, performance data and prices have never been answered in full, or replied to either in

adequately or too late for consideration. Nothing can be a more unfavorable impression in the minds of prospective buyers. It is realized that some manufacturers were for a time unable to meet domestic demand and that, during certain periods, they have been looking up for new models. It is suggested that regardless of whether a sale can be considered at the time customers are made in any inquiries from abroad. Careful and expeditious replies to inquiries from foreign countries will map directly to the future when the airplane manufacturer is desirous of obtaining foreign business.

IT IS UNNECESSARY TO HAVE at hand rates of import or customs duties except as indications of market potentialities, for these duties are absorbed by the importer and should under no circumstances be included in the quoted prices. Aerospace products are so new to some of established trade that some governments have not yet established rates for them, while others assume the attitude that the benefits accruing from airplane operations warrant the encouragement of airplane export and parts imports in the interest of allowing free entry. It should be considered that rates of duty are subject to change and any quotation covering a great number of countries would soon be out of date and of no use, therefore of negative value.

In that connection certain countries assess duties, particularly on parts, on the basis of the components, each item taking a different rate. As there are no many component parts of an airplane and engine, and each would be classified differently in certain tariff schedules, it would be impracticable, if not impossible to furnish all rates for all countries. It should be considered that if a market exists in a foreign country for United States aircraft, the tariff will have small bearing upon the successful conclusion of the sale. Possibly no country with the exception of certain British colonies in favor of products made within the British Empire grant lower duty rates to European aerospace manufacturers than to Americans.

The Division of Foreign Tariffs, through the domestic offices, will be glad to answer inquiries as to the various duty rates assessed on aerospace equipment. Here again it is pointed out as being advantageous to contact with the local office as it may have the required data immediately available.

Translation bureaus, foreign language schools, and some foreign students in universities are capable of making translations. Care should be exercised in the selection of competent translators, particularly for purposes of translating English into a foreign language. The local Department representatives can often advise where the services of satisfactory translators may be obtained. English is becoming, to a certain extent, the international commercial language and since foreign firms and individuals with which aerospace exporters deal, would have a

working knowledge of that language. It is sometimes politic, however, to make reply in inquiries in the language of the importer, as it is certainly necessary to have advertising and sales literature prepared in foreign languages. Of utmost importance in sending advertising literature in that of having translations made properly so they will not be ridiculous in the eyes of foreign readers.

Questions are in practically all cases required on what is known as a C.I.F. basis (C.I.F. meaning all costs, insurance and freight to the port or point of entry must be covered) or as specified by the customer. Included in these questions should be the F.O.B. price, crating costs, delivery to steamer, or point of entry if overland, and if the shipment is destined for a point overseas, the ocean freight and marine insurance. It is unusual that the manufacturer or exporter obtain the necessary data and submit the basis of questions requested.

Properly speaking, there are no factors other than those usually included in C.I.F. price, but in some countries where the commercial loss is assessed before shipment the cost of consular documentation should be included. It is not difficult to obtain information as to the various rates entering into a C.I.F. quotation.

THE SEVERAL railway freight office can furnish rail rates, and if shipping freight office can furnish marine insurance rates are also located in the vicinity, the local district or cooperative office of this Bureau can advise where to get the information needed, or can obtain it. Considerable business has been lost by airplane and other manufacturers who have quoted on a F.O.B. basis when C.I.F. quotations were requested. The reason for this is that the shipper cannot, without considerable trouble and expense, obtain the rail rates, marine insurance and ocean freight rates, whereas this information is more readily available in the source of the shipment.

Crating is an item entering into a C.I.F. quotation and it is important to figure correctly the cost of material and labor involved. It has been directed to our attention that a satisfactory crate was made for a single engine cabin plane of 220 hp at a cost of \$350, and an export crate for a two-place open cockpit monoplane of



Travel for products being shipped to overseas. (Photo)



Loaded planes on the deck of a ship bound for foreign ports.

60 by for as low as \$150. As airplanes are of comparatively light weight the ocean freight rate is usually calculated on a cubic rather than weight basis. Because of this there is no reason why crates should not be made strong. It is advisable to enter the airplane and engine with tar paper to prevent damage from salt water. The Packing and Materials Handling Section of the Transportation Division, has prepared some specifications of airplane crates used for export shipments and these may be obtained through the local office.

The local offices of this Bureau are in a position to advise where the certificates of origin and other consular forms necessary may be obtained and can further advise where to go for aid in their execution. Some banks and most freight forwarders with branch offices in important centers are equipped to handle the actual paper work on foreign shipments, which in some cases, is quite involved. Charges for this service, included with those for the main service of freight forwarders and banks with foreign departments, are very reasonable. When a consular invoice is required and a consular office in the country involved is not located in the vicinity, the forwarder and banking connection can sometimes arrange to have the consular papers entered and mailed at the seaport. The local office can advise when firms and individuals performing this function are located as it can in regard to officially published sources of detailed information on documentation as the result that the manufacturer or shipper desires to handle the paper work within his organization. The office can also advise where consulates are located.

INSURANCE FOR OCEAN SHIPMENT is underwritten by firms specializing in this business. A list of these firms may be obtained from the local office. At present the form of coverage for airplanes follows that for automobiles and is generally on the basis of so many cents per each \$100 of value, depending on the value of the cargo which the crates are shipped under deck, includes coverage for breakage, theft and pilferage. The rate on planes stored above deck is considerably higher and the form of coverage is not as liberal as the under deck policy. The cost of marine insurance is one of the charges to be included in the quotation and is in all cases assumed by the shipper.

Distributor's agreement, in some instances, cover the subject of financial arrangements and credit, and specify that before shipment, which, in the case of a foreign sale, may mean an immediate letter of credit which has been received by the foreign buyer with some American bank. The bank should confirm to the exporter the fact that such a letter of credit is available and under what terms and for what amount the letter of credit is opened. These when shipment has been made the bank will pay the amount specified by the invoice, if not conforming the credit that has been opened, against presentation of the ocean Bill of Lading; the consular invoices and any other documents that may be necessary. This method of payment before the shipment leaves the country, of course as the initial cost but must be accepted to rigidly if the volume of export business is to be appreciable. The practice of extending credit to foreign buyers may be as thoroughly established as it is in the case of domestic buyers. In this connection, it should be considered that the automotive industry insofar as the manufacturer is concerned has, since its inception, insisted upon cash before shipment, consequently has been organized to handle credits on foreign shipments and unquestionably these

will soon be finance houses who will take care of credits in the automotive export field. It is recommended that the inexperienced exporter always consult his banking connection about methods of transferring funds and on that of credit.

The most important factor of course, in granting credit is that adequate investigation be made. The Commercial Intelligence Division of the Bureau has reports, available through the local offices, on over 100,000 foreign importers. The world organization of field offices which keeps the Commercial Intelligence Bureau con-



Stinson plane on sale in vision for use in the mail service of that country.

stantly supplied with up-to-date information on foreign firms can also make special and immediate investigation in case of need. In addition banks, insurance agencies, foreign credit associations and the credit agencies in a position to supplement the Government reports or give the prospective seller the benefit of the larger experience of others.

Variations in laws of different countries make it difficult to generalize as regard to the subject of distribution and delivery agreements. The Commercial Laws Division of the Bureau, through the local offices, is in a position to advise on this subject although it is not the function of the Division to act as an attorney. Lists of attorneys in this country and abroad competent to draw up suitable agreements may be obtained upon application to the appropriate Bureau office.

It is of great importance to see to it that, when possible, advertising matter goes into a foreign country without the necessity for expense on the part of the consignor. In all countries this cannot be accomplished nor is it always possible to prepay duties which are sometimes assessed on advertising literature. There are certain marking requirements which should be observed as well as methods of shipment applicable for certain countries in order to assure freedom from duty or the lowest possible import duty rate. It is not the need for information on this important but frequently ignored question point the Division of Patent Rights has prepared Trade Promotion Series No. 76, "Shipment of Samples and Advertising Matter Abroad." This publication also serves as a complete guide to the use of patent laws in foreign countries.

Probably the first step toward getting a product be-

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fore the prospective consumer is to send descriptive literature including specifications and performance data to a selected list of firms and individuals logically on the market for airplanes for sale or for their own use. The Association Trade Division has disseminated lists for this purpose which will be revised when the occasion warrants. American consuls and representatives of the Department of Commerce should check such be supplied with a few sets of literature. House agents such as published by certain responsible manufacturers can be mailed ahead, although sales translated into Spanish would be of much value in the Spanish-speaking countries. Other foreigners on the market for airplanes, particularly those in Europe would be able to send English or if not able to, and if sufficiently interested, could have translations made without much delay.

There is one exception to this general rule and that is in the case of Spain, where Portuguese is spoken. It would hardly be worth while to translate a considerable number of catalogs and other literature for this market. Some manufacturers after a Spanish distribution campaign might let him make the translations, the lowest showing all or a part of the expense of reprinting in Portuguese. This procedure has been followed in other lines of business and there is no reason why it would not work out advantageously for the exporter of automotive products.

Similar literature consisting of brochures, catalogs, tables of performance data and specifications as prepared for the domestic market are in most cases readily available for foreign consumption as the typical aviation is universal and the same factors which would be considered favorably in this country would appeal abroad. The agencies also to advertising copy.

ADVERTISING way of reaching the foreign market is by advertising in the foreign newspapers. The Aviation Division of the Bureau, through the local offices, can advise where such journals are published, their reader influence, circulation and rates. Advertising agencies handling the placing of copy in foreign periodicals are in a position to supplement the information available from the Aviation Division and can advise whether or not advertising in specific foreign markets should be warranted. Because of the limited market for American aircraft in Europe it would hardly be worth while to advertise extensively in European periodicals, while in South America and the Antilles the few automotive agencies may be considered good mediums. Some of the United States publications catering to foreign importers and dealers in automotive products and general merchandise lines are worthy of consideration.

It is only by actual demonstration in the field that some markets can be opened for airplanes. Sending one or two airplanes to South America, for example, would be costly and the immediate results may not appear to justify the expense. It is believed, however, that if any appreciable foreign business is to be obtained the substantial expense necessary will be necessary.

The points in the West Indies and Central America presenting possibilities for aircraft sales could be covered as made to South America. Export plans, of course, should be chosen to fly these demonstration airplanes and if the pilot is not an experienced business man, with a speaking knowledge of Spanish and Portuguese and conversant with the Latin American market, it should be accompanied by a man qualified in this respect. A man with such abilities could contact with

distributors and perhaps act in the promotion of international airlines for which there exists an apparent need. It has been estimated that it would cost from \$5,000 to \$15,000, depending on the type of airplane, to send a demonstration plane and personnel to South America, promising that the plane was sold there. The manner of market conditions in each country will make brief mention of airports available for use by demonstrators, and on which trials may be obtained from the Foreign Information Section of the Association Trade Division.

It is possible that manufacturers of well-known types of aircraft could obtain suitable distributors without sending a demonstration plane by sending an experienced traveling representative, of the kind that has actual control in the most influential circles of the countries to be covered. Such a representative could visit the publications of the Bureau of Foreign and Domestic Commerce, which would be of value to him, such as the "Commercial Traveler's Guide to Latin America" (Miscellaneous Series No. 89) giving information as to wireless transportation, customs, hotels, customs, etc., of all the Latin American countries.

IT HAS BEEN estimated that a would cost a minimum of \$5,000 to send a \$5,000-per man on a four months' trip to visit all the important Latin American countries. This man could be supplied with operating cost data, models of airplanes, and do a great deal of preliminary work of value. His greatest task would be to make connections for the manufacturer with representatives in a position to negotiate sales after his departure from the territory. Frankly, it may be said that a man capable of this sort of work would command more than \$5,000 a year. Considerations on business realized as the result of his work would actually enhance his incentive as well as his income, in addition to the \$5,000 fee. Such men in Europe or the Far East could make their headquarters at central points such as Paris or Shanghai and journey to other localities upon advice from the factory or other sources that potentialities exist elsewhere in the territory for airplane sales.

Few organized distributors of airplanes are in contact in foreign countries, such as those within the United States, where there is the vast ground from being "hamstrung" and kind lease operations, with war surplus equipment, to commercial airplane distributors and dealers. In foreign countries commercial pilots, with the exception of those employed in established airlines, are scarce and there are few men qualified to handle the "fixed base operators." Accordingly, it will be necessary for airplane manufacturers to seek outside other than the type which has pioneered the distribution of airplanes in the United States. These other types of airplane can be having considerable success with military dealers, department stores, etc. The foreign aviation distributor and dealer appears to be the most logical class of prospect for the handling of airplanes. General merchandise firms dealing in hardware and agricultural implements, and machinery houses, would in some cases serve as good connections. Nations with such war experience have been known to extend such firms as those in the importation of airplanes. Organizations with shops for the repair of automobiles and tractors could expand their facilities for the repair and service of airplanes and aircraft. The current of firms doing aircraft work in the United States and abroad might be interested are available at the Aeronautics Trade Division.

THE NEW *Detroit* CITY AIRPORT

By JOHN T. NEVILL
Detroit Editor of AVIATION



ARCHT. drawing of the Terminal building to be erected at the Detroit City Airport

A FITTING EXAMPLE of how carefully located municipalities can be converted into a public work among one grade is the new Detroit City Airport in which the Motor City is being laid this week, the third annual All-American Aircraft Show.

A majority of the pilots and aircraft executive handling these the airport are perhaps feeling it difficult to believe that little more than one year ago the property under guidance of the municipal Department of Public Works, was just beginning to emerge from the mire of had known for years, that the entire length of its longest stretch was marked by a creek bottom, no through, well, 200 ft. wide road, in places, as much as 20 ft. deep, that the property was, in fact, two rectangular tracts going 80 deg. from one another and completely separated by a paved public thoroughfare several hundred feet wide that previously, even square feet of both of these tracts was left ground; that the very intersection of these two tracts was the site of both a gas-holder, 350 ft. high and a cemetery containing 1,400 graves, with plenty of left left for more—a forced "cure and effect" coming for the custom stream—and as if this were not enough, the property also was not without the inevitable high water power line, which stretched along its longest border dangerously high above the ground. And—oh, yes—a \$200,000 garage and supply building owned by the Detroit Fire Department was situated well within the one end area, which meant that it had to be razed and rebuilt shortly.

These, and other "little" matters, like the condemnation and rebuilding of a gas plant, the condemnation of a cemetery, and the consequent removal and removal of 1,400 dead, plus clearing of a much and public thoroughfare over the position of a hundred un-surveyed and inappropriate taxpayers, mean all the factors city officials had to take into consideration.

A rather discouraging picture was an accretion standpoint, but not entirely hopeless. Two other important facts determined the definite selection of the site for development as an airport. One was that the City of Detroit already owned the property and the other was that the site was close-in, being only five miles north-east of the City Hall. So, late in 1935, while the City's legal department was just beginning to make out the mass of litigation that, to some extent, still clings about the airport, like so many persistent crickets, the Department of Public Works, under direction of the City Council, relied up its sleeves and began to "drive out the crickets and frogs."

The members of the industry who visited the 1939 All-American Aircraft Show heard many rumors about the "accidental" airport which would be the scene of the 1939 show. Those rumors, like many others that were floating about at the time, were promptly forgotten by many as soon as the city limits of Detroit passed by the trailing edge of the lower wing. However, rumor has become a most decided fact, and the "accidental" airport is the scene of the 1939 All-American Aircraft Show. In this article Mr. Nevill describes in detail the equipment installed, and relates of the various obstacles that had to be overcome before the port was a reality.

Before going into detail as to just what the Detroit City Airport is like today, it might be explained that the gas-holder and the cemetery are still there. Although other development work on and about the airport has advanced considerably since somewhat serious pre-war. The Fire Department garage, of course, has been razed, and the power line has been placed underground. Although, however, separate, particularly 180' area lying between the gas-holder and the original presence of the two tracts, has yielded its airport area to approximately 250 acres. The driving of French Road, the famous thoroughfare, is at this writing, still an unaccomplished action, and the city is bound being seized by a taxpayer's question, although two of the airport's hard surface runways now, extend across the road and surface traffic along the thoroughfare is controlled to accommodate airplanes using either of the runways.

Nevertheless, these drawbacks, which, true, no doubt, will cause Detroit City Airport today is a credit

to the community, particularly when considering its construction. Its site and equipment is sufficient to give it a first-class rating. Department of Commerce rating and when night lighting facilities are completely installed Detroit's airport will possess an A-1-A rating. The entire property has been filled in, graded, drained, seeded, culled and fenced in. Approximately one million yards of fill were required to grade the property, so that it had no drainage more than 2 per cent in any direction. The drainage system consists of 17 miles of 4-6 in. drain tile in these filled trenches and five miles of 12-18 in. lateral sewer, laid in grid fashion and connected to a trunk sewer, which is a part of the city's sewage system. The fencing is of the chain link and wrought iron type and measures in all 32,600 ft., or nearly five miles.

Three hard surfaced runways (concrete and asphalt) extend for a total distance of 2½ miles at this writing. One of the runways extends along the center of the north-south airport leg for a length of 4,500 ft. The second runway extends down the east-west leg for a distance of 4,150 ft. These two runways intersect near their lower ends. The third runway now is extending diagonally across these two landing strips like the cross member in a letter A, and measures 2,825 ft. in length. When completed such runway will consist of two parallel, 100 ft. wide and 300 ft. apart all of the surface being variably drained. Although the "double runway" system has not been completed except for 1,000 ft. on the north-south strip, its construction is not far off. It is also proposed to put in a fourth set of runways extending diagonally across the east-west, or lower leg, and running at an approximate right angle to the diagonal runway now connecting the two legs. The runways already in have cost a total of \$262 ft.

It is accurate the use of paved runways and at the same time going to considerable length in developing the remainder of the field is was the idea of City Engineer Perry A. Fellows, and William J. Wallace, engineering manager of the airport, to embrace both the hard surface landing strip theory and the "all-weather" idea. The double runways parallel one another, were, of course, designed to accommodate a traffic control system to be placed in effect later. Mr. Wallace, incidentally, has worked out a system of traffic control especially for hand-flying the hundreds of planes expected on the airport during the Show.

The city built the first hangar at the airport in April last year. It is a comparatively small but completely

modern building costing approximately \$55,000 and suitable for about 15 planes. Since then a \$42,000 hangar and field office building has been privately built and is now being used by Schleier-Brock Aircraft Corporation, as has a somewhat smaller hangar by Lawrence P. Fisher. It might also be said that about a year ago the City Council placed operation of the City Airport in the hands of the Commissioner of Public Works, whereas Mr. Wallace, a member of the city engineer's staff, was placed in direct charge of the work as acting-manager, with the title of Engineer-in-Charge. Since that time Mr. Wallace has become a regular pilot and now is about to make his first solo.

Another matter that must be mentioned involves the night lighting facilities. A Molochian boundary lighting system costing \$23,850 has already been installed, the Council has just bid a contract for installation of obstruction lights, and has asked for bids on a 4,000,000 c.p. revolving beacon, as well as a 5,000 c.p. auxiliary or

WILLIAM J. WALLACE, engineering manager, Detroit City Airport, and K. D. Belinger, Department of Commerce engineer at Detroit, show drawings of the following: a traffic circle, which, as addition to the road Department of Commerce regulations, are being strictly enforced at City Airport during the All-American Aircraft Show.

- ▶ All traffic around the airport will be controlled clockwise.
- ▶ Before leaving circle airport 180 deg. counter-clockwise to get in line of traffic.
- ▶ If anyone strays outside the airport, an aircraft observer, will be 1,000 ft.
- ▶ Takeoffs will be made from a point designated by the owner and only on the owner's signal.
- ▶ No stall, landing, taxiing, or climbing turn will be permitted on runway, and such maneuvers will be regarded as accidents.
- ▶ Plans taking off will show the boundaries of the airport before commencing the first turn, which must be to the left.
- ▶ Landings will be only on the area designated by the pilot manager, and marked with a T, and should be made in three to five to be possible.
- ▶ No acrobatics, except over the runway area north of the airport and east of the runway there will be permitted.
- ▶ Procedures must be known in all emergencies.
- ▶ When anything requires repairs must be located and the engine must be accepted.
- ▶ Pilots must not be left with engine running, unless someone is in the cockpit.

identifying bays. A system of floodlighting the peculiar shaped field from atop the gas-holder is now being studied and the soil for bays on flood lights will await the findings of this study. It is reported, however, that a number of manufacturers of airport lighting equipment, exhibiting in the Show, have offered to give practical exhibitions of their products by floodlighting the field with temporary installations during the Show.

AFTER a series of inter-sectional or inter-departmental agreements, during which the City Council faulted the main hangar project back and forth among themselves, an architect who had been retained by the Council to design the hangar was paid off and the Dept. of Public Works given the assignment of designing and contracting for construction of the building. Despite the handicap of having to use more than \$300,000 worth of steel contracted for by the Council, designed and fabricated for the original architect's building and having to erect a totally steel building costing approximately half as much as the originally designed structure, the Department and the W. E. Wood Company, contractors, have completed a strictly modern hangar and administrative building that can be rightfully called the world's largest airplane hangar.

The Detroit City Airport Hangar extends north and south for a distance of 1,034 ft. along the lower or southern portion of the airport's north-south leg. To be more explicit it lies between the cracker, which borders French Road on the east, and Canons Avenue, which borders the north-south leg on the east. As stated, it is 1,034 ft. long and 250 ft. 3 in. wide at its widest portion, which is through the bay at the southern end. Throughout the middle section it is 304 ft. wide and 127 ft. 5 in. wide through the northern bay, which bay doors

the port's middle area. This latter section will contain the administration offices, customs and immigration offices, ticket office, concession, pilots' club room, newspaper press room, lounge, and other features, all grouped around a large waiting room similar to that of a railway depot. This bay, alone, measures 127 ft. 5 in. x 114 ft. 4 in. outside.



Percy A. Wilson, City Engineer, 1936.

The building contains a total of 325,000 sq. ft. of floor space, approximately 193,000 sq. ft. of which will be used for storage, service, and loading purposes. Just behind the administrative section, is one large bay, the inside dimensions of which are 180 x 200 ft. Just south of this is



Air view of Detroit City Airport. A—hangar and cracker building. B—cracker hangar. C—land available for future development. D—gas-holder. E—land owned reserved.

Contructed of steel and brick, with approximately 60 per cent of its exterior comprising door and window area, the huge building has a strong tendency to dwarf the field, although, due to its location it is completely out of the way of all flying activities. The floors of the hangar proper are of concrete, suitably dressed, and all interior walls are faced with suit glazed material face "Brickite". Roofing is of Johns-Manville 15 year bonded composition over 3/4 inch "Insulite" insulation and resting on a pre-cast Haydic concrete channel steel deck.



Front view of main hangar and cracker building at Detroit City Airport. Note central tower.

the large central section containing 10 bays, each 121 x 100 ft., which space, in turn, gives way to two additional bays at the southernmost end, each measuring 115 x 125 ft.

The structure is founded upon a total of 1,102 concrete piles, each rooted from 25 to 50 ft. in the ground. Floors of the hangar proper are of concrete, suitably dressed, and all interior walls are faced with suit glazed material face "Brickite". Roofing is of Johns-Manville 15 year bonded composition over 3/4 inch "Insulite" insulation and resting on a pre-cast Haydic concrete channel steel deck.

The experimental airport operator will be interested in the heating, lighting, operation of the doors, and fire prevention features of this structure, all of which have been installed at a great primary cost to the city. Probably the most interesting of these is the unique type fire prevention system, which was installed by the Automatic Sprinkler Corp. of America at a total cost of \$151,500. The system consists of 2,600 dry pipe ceiling and floor heads which go into operation automatically following a rise of temperature rate of 15 deg. per minute. Thirty-five hundred of the heads are located in the ceiling and 1,500 in the floor, all being spaced 15 ft. from one another in each direction. Every 6,000 sq. ft. of space above the bottom of the building's trussing is covered by a metal draft curtain, which concentrates the heat, causing early operation of the heads in one compartment and preventing operation of more heads than are necessary to extinguish the fire. Each one of these 6,000 sq. ft. areas is equipped with its own 6 in. sprinkling valve, which valve is opened by any one of four actuating devices located in the compartment.

It should be understood that the degree of heat, alone, will not affect the actuating devices; rather, their operation is caused only by the rate of temperature rise of at least 15 deg. per minute, which places the possibility of their going into operation during excessively hot mid-summer days quite out of the question. Following total extinction of a fire the valves are closed manually. The entire sprinkling system is fed by a 24 inch water main, the center of the city's system, which operates under an approximate pressure of 50 lb.

The concrete doors, each of course, extend along both sides of the structure, one of the tubular struts

truck type and supported on 16 ft. with flush with the floor. In the smaller bays a 20 x 90 ft. clearance is provided, while that of the larger bays is 25 x 149 ft. Although the larger doors provide sufficient clearance to admit the largest heavier-than-air craft now built in this country without necessity of disassembling, precautions have been made to increase the height of the doors from 25 ft. to 30 ft., when that seemed necessary. The larger doors, incidentally, have been actuated by installation of Allen and Drew duplex drive heavy duty electric motors, and can be opened or closed by the pushing of a button inside the motor.

Heating in the hangar area is provided by four suspended American Radiator unit heaters employing a normal gauge pressure at the boiler of 125 lb. per sq. in. Multiple outlets in these heaters will discharge air at high velocity. The system is designed to maintain a heating air temperature of 55 deg. F. under the most severe outside winter conditions. A lighting system providing approximately one Watt per sq. ft. and controlled from panel boards located near the entrance of each bay takes care of night-time illumination. The large percentage of window and door area already mentioned will provide ample daytime lighting.

ALL OF THE WORK done at Detroit's city airport, the filling, draining, grading, runways, fencing, lighting and the two magnificently erected hangars now completed has been financed by a portion of the \$5,000,000 bond issue voted by the taxpayers in November, 1928. Before closing it should be stated that the main layout, architect of the projects, was designed to fit a more comprehensive future plan, prominent in which plan is the proposition to erect a separate administration building, freight warehouse, which would increase service and storage facilities in the present hangar by nearly 15,000 sq. ft. Under architect's drawings already prepared this future structure would occupy the area now belonging to the country association, which the city is attempting to purchase at the present time.

In fact it has been stated that when it is absolutely necessary, it will not be expensive to acquire practically all of the property now lying between the airport's two 80 deg. legs, and turning the property into a triangular airport rather than an L shaped one.

WHAT THE Industry IS

A Listing of the Various Products of Airplane and Now or that Will be Placed

IN THE International Aircraft Exposition number 1 of Aviation (Feb. 15) there was printed a symposium by leaders in the American aeronautic industry on 1930 merchandising and design trends of both air craft and engines. The symposium, which was continued through two other issues of Aviation, was the result of a questionnaire sent to the industry's executives with the request for individual expression of opinion. The expressions of opinion regarding the industry's mar-

ket problems were not only interesting but most informative. Therefore it seems altogether fitting that this Merchandising and Show Showdown of Aviation should contain a listing of the products that these manufacturers intend to develop and merchandise during the current year. Many of them are on exhibition this week in the main hangar and exposition building at the Detroit City Airport; the others we now expect to view between now and the Yalestic season.

Airplanes

ALLISON

FIVE NEW PLANS will be offered by the Allison Aircraft Company of Lawrence, Kan. The first is a single-seater, semi-cabin, high-wing monoplane with a Salsbury 40-hp. engine, which will be priced at \$1,785. The second will be a two-seater dual control high-wing plane powered with a Velle or Leffland engine, and priced at \$2,285.

As a third offering, the company will put out a two-seater, side-by-side, high-wing open monoplane, powered with a 30-hp. air-cooled engine. The fourth plane will be a single-seater light biplane with an engine of approximately 30 hp. Data on the last two planes, at the present time, are not available.

AMERICAN EAGLE

A NEW four-place cabin monoplane is being introduced this season by American Eagle Aircraft Corp., Kansas City, Mo. The standard model carries a Wright J-6 165-hp. engine, but other engines can be fitted if desired. Features of the plane are wide visibility, 9-ft. landing gear road wheel brakes, tail wheel, folding wings, three doors to the cabin. High speed with the 165 hp. engine is given as 142 m.p.h.

Wallace Aircraft Co., division of the American Eagle corporation, will continue to build the Wallace Yearo-plane, a three-engine folding-wing cabin monoplane selling for \$5,795 with Kinner engine. The Wallace plant is now located in Kansas City. The American Eagle company will also continue to build five models of open

cockpit biplanes, with power plants ranging from GN-5 to Wright J-6 325-hp. engines, as part of a program which aims to present a wide variety of planes.

BIRD WING

THE BIRD WING COMMERCIAL AIRCRAFT COMPANY of St. Joseph, Mo., will concentrate production during 1930 on the Bird Wing biplane. This plane is particularly adapted to use by flying schools and for private and cross country flying. It has passed all of the approved type certificate tests required by the Department of Commerce.

BURL

THE BURL AIRCRAFT CO. of Marquette, Mich., has announced a conservative production schedule for the year 1930. During the coming year, the company will continue to merchandise Americanas, with models ranging from the 40-hp. cabin monoplane priced at \$19,900 with Wright Cyclone on Hornet engine to the three-place cabin machine selling for \$11,000 with Wright J-5-hp. engine.

BOEING

IT IS NOTWORTH the ordinary planes which will be built for the Army and Navy, Boeing Airplane Co. is now featuring several commercial models. Model 300, a sportsman's version of the P-12 military model, developed speeds in excess of 200 m.p.h. during recent tests.

OFFERING FOR 1930

Engine Manufacturing Companies that Are Available on the Market This Year

The company is also offering an improved modification of Model 204, six-place flying boat, with speed said to be increased 15 m.p.h., rise-of-reload by 6 sec., and sale of climb improved by 250 ft. per min.

Two types are offered for transport use. The 40-B-4, four-passenger mail plane with Hornet engine and top speed of 180 m.p.h., has been in use for some time on several different routes. A new eighteen-passenger transport, representing a development of the company's earlier model 88, was introduced last summer, and several of the planes are now in active service. All Boeing commercial planes are now shielded and wired throughout for radio installation.

BURNELLI

THE LAST OFFERS by Caproni-Burnelli Aircraft Corporation, for 1930, will include both large and small planes. Burnelli markets its twenty- and thirty-passenger capacity, at \$25,000 and \$35,000 respectively will be built to order. The company will also offer twenty- and thirty-passenger amphibians using the Menasco amphibian gear. These amphibians will sell for \$65,000 and \$69,000 respectively.

Accurate land, sea and amphibious planes will be produced. These are two place low-wing monoplanes with open cockpits. The amphibians, with 100-hp. engine, sell for \$5,000, the seaplane, with a 60-hp. engine, for \$4,300, and the land plane, with the same engine, for \$3,900.

Accurate motion propellers of all sizes will be built to order. Aeromarine, radial, air-cooled, 115-hp. engines will be built. This engine holds the Department of Commerce Approved Type Certificate Number 41.

CURTISS

SEVERAL MODELS of the Pledging three-place biplane Commander, using a variety of engine equipment, will be offered by Curtiss Aeroplane & Motor Co., Genoa, Ill. J. N. Y. Asclepe from additions to the types of engines with which it can be fitted, the plane will be substantially the same as last year's model. The company is also introducing the Knight, a two-passenger, cabin monoplane, powered with two Wright J-6-7 engines.

Curtiss-Baker Aircraft Manufacturing Co., St. Louis, Mo., will continue to produce the Robin, a three-place cabin monoplane powered with Curtiss Challenger, GN-5, or Wright J-6-5 engine. A modified Robin set-

ting four has also been introduced, resembling the three-place machine closely in other respects. The price of the three-place Robin is \$4,000 with GN-5, \$7,500 with Challenger or Wright engine.

CAVALIER

FOUR TYPES of Star Cavalier cabin monoplanes will be produced in 1930 by the Star Aircraft Company of Bensenville, Ill. All of these planes will be identical except for engine equipment. Two models powered with Lambert engines of 65 and 90 hp., respectively, will sell for \$2,985 and \$3,430. The model with the Gnat will sell for \$3,785, while that powered with a Leffland will sell for \$2,985.

COMMAND-AIRE

COMMAND-AIRE Inc., Little Rock, Ark., begins 1930 with three models in production. A two-place training plane, with Warner engine, having Goodhue air wheels as standard equipment, sells for \$4,365. The standard Command-Aire three-passenger open plane is now offered with Challenger engine at \$5,950, and with a Curtiss at \$1,000 more. A new model with a Lycoming 200-hp. engine, special landing gear and tail wheel, sell for \$5,625. It is anticipated that other models will be added to the line later in the season.

EASTMAN

EASTMAN AIRCRAFT CORP., which began one of the units of Detroit Aircraft Corp. last year, will continue manufacturing of the three- to four-place open flying boat which has been the company's standard model for some time. It is powered with a Curtiss Challenger engine, installed in close a pusher type propeller, and the list price is \$9,595. Flyaway Detroit.

DAVIS

DAVIS AIRCRAFT CO. is presenting two new biplane models for 1930: the Davis D-1 powered with the Leffland 65 engine, and the Davis D-1-K powered with the Kinner engine. Both are two-place open cockpit planes, and both embody the wing design characteristics of Davis' Veeplanes.

Both the Davis D-1-K and the Davis D-1 are of all-metal construction throughout, with the exception of

wing spans of laminated spruce, and fabric covering. Ribs are of duralumin. The entire leading edge is of sheet duralumin attached to spars and riveted to ribs. Drag bracket is of double Harsbom square rod. Simplicity of design permits removal of wings in five minutes. The Davis D-1 fits at \$3,885 complete, and the Davis D-2-K at \$3,485 complete, flyaway at field, Richmond, Indiana.

EAGLE ROCK

ALEXANDER AIRCRAFT CO., DENVER, Colo., will continue to produce the well-known Eagle Rock three-passenger biplane during the coming year. It is offered with Wright J-6 Plus Engine, or Kinner engine, being priced at \$3,957 with Kinner power. The plane is also obtainable as kit engine and propeller for use with OX-5, OX-6, or Hiss engines.

In anticipation of a growing market for first cabin planes, the company is featuring the Alexander Junior, a four-passenger low-wing monoplane, introduced last year, which is said to have a speed of 125 m.p.h. with Wright J-6 165 hp. engine. As in the past, Alexander Aircraft Co. will continue development of its own nationwide system of distributors and dealers. A primary type dealer is also mentioned in the line, as it is felt that through the development of gliding, the market for planes may be increased.

ENGINEERS

ENGINEERS AIRCRAFT CORP., Stamford, Conn., is planning to put a new plane into production. This plane will be known as Model EAG-1, is a two-center, inter-ride, padded monoplane, for sport and training. Due to a wide sweep-back of the wings, good stability is provided. The plane will be completed by a Wright Gypsy engine, and will sell for about \$5,000.

FAIRCHILD

A NEW two-place open biplane for sport and training, added to the line of planes offered by Fairchild Aviation Corp., Farmingdale, L. I., N. Y. It is designated as model KR 21, for 1930. This model sells for \$4,085. The company will also continue production of the Fairchild KR-24, three-place open biplane with Wright J-6-5 engine, selling for \$6,375.

Two cabin monoplanes, features folding wings, are included in the Fairchild line. Model 42 is a four-place machine with dual control, powered by a Wright J-6-9 engine, selling for \$12,900. Model 77, intended for transport use, carries seven passengers and uses a Wasp engine. It is priced at \$18,900.

FLEET

THREE MODELS comprising the line offered by Consolidated Aircraft Co., Buffalo, N. Y., for 1930. The Fleet two-passenger training plane, a development of the Fleet training planes made by the same company for the Army and Navy, is offered in a new model with either Kinner or Warner engine, priced at \$3,885 and \$4,985, respectively, in kit form.

The Fleetster all-wood monoplane, designed to carry six passengers with dual or flight at a high speed of 175 m.p.h., will be put into actual production. See models

are being built on positions for MYRRA line. With lead type and cowings and Hornet Series B engine, the plane sells for \$27,500. The Consolidated Co. will also continue production of the Commander four-engine twenty-passenger flying boat, fourteen of which have been ordered by MYRRA line. This plane also carries Hornet power, and is listed at \$125,000.

FOKKER

THE PRE-EXISTENT development of the Fokker Aircraft Corp., Hawthorne Heights, N. J., for 1930 is the F-32, the largest high plane built in America. The first of the six planes of this type ordered by Western Air Express is now in service, the second is in process of delivery and the remaining four are on the construction line at the company's Hawthorne Heights plant.

With the amphibian and best priced at \$44,000 and \$46,000 respectively, the tri-engine machine at \$67,500 and \$49,500, the civil planes at \$26,500 and the Super-Universals at \$21,800 and \$15,000, the Fokker line remains in the relatively high price class.

FORD

AMONG THE NEW MODELS in the 1930 line of Ford all-metal tri-engine planes, built by Stout Metal Aircraft Co., Dearborn, Mich., are the de luxe club planes of the 3-AT type which are furnished with either landing gear or pontoons and which are offered with a wide choice as to interior accommodations and decorations. The price varies from \$60,000 to \$65,000.

Another Ford plane recently introduced is the 3-AT tri-engine land plane. Its dimensions follow closely those of the 3-AT, the essential difference being the substitution of two Wright J-6 300 hp. engines for two of the Waspes. This gives a total horse power of 1,025 and results in marked economy in operation. The maximum speed is 134 m.p.h. and the cruising speed 120 m.p.h. The price is \$51,000.

The Ford line also includes the 4-AT land plane and the 6-AT air plane, each powered by three Wright J-6 engines. The 4-AT sells for \$42,000 and the 6-AT for \$64,000.

The company also builds a 9-AT, which is of the same size as the 4-AT, but which is powered by Pratt & Whitney Wasp Junior engines.

KARIKEEN

KARIKEEN AIRCRAFT, INC., ST. LOUIS, Mo., will produce the Kari-Keen four-place cabin plane, a four-place plane designed for the use of training schools and private owners. The plane is built to sell at \$4,490 delivered at the factory. It has side-by-side seating arrangement, and uses a full cowling wing.

KREUTZER

JOSEPH KREUTZER CORP., Los Angeles, Calif., will continue during 1930 to produce a tri-engine cabin plane. Four models will be offered: the K-3, powered with three 90-hp. LeRhain engines will sell for \$19,000; the K-4 and K-5, powered with Warner and Kinner engines respectively, will sell at \$22,000 and \$20,000; model K-6, a five-place plane equipped with Edo floats and three Kinner engines, will sell at \$23,000. The present factory capacity is six or seven planes per month.

LINCOLN

A LINCOLN, Kas., the Lincoln Aircraft Company will continue to produce their well-known line of PT aircraft. The original PT equipped with a rebuilt OX-5 engine will sell for \$2,265. The Lincoln PT-K powered with a Kinner engine will sell for \$3,865, while the PT-W, equipped with a Warner engine, will sell for \$4,315. All of these models carry a Department of Commerce approved type certificate.

LOCKHEED

LOCKHEED AIRCRAFT CO., Burbank, Calif., continues production of the five- and seven-passenger Vega, the four-place Executive, and the new one- or two-place Sirius low-wing monoplane. All four models have Wasp engines, and are priced between \$14,500 and \$19,250. The characteristic Lockheed combination with cantilever wing and plywood monocoque fuselage is, of course, continued.

The factory at Burbank, Calif., now has a capacity of twelve planes per month, and a policy of two-week delivery has been adopted so that finishes and painting can be applied to individual purchasers.

METEOR-PLANE

IN ADDITION to continuing production of the standard line of Meteor-planes, Irwin Aircraft Co., San Francisco, Calif., will introduce a new model designated as M-A-1. It is a one-place open biplane, powered with the Irwin four-cylinder radial 20 hp. engine, said to give it a top speed of 85 m.p.h. The plane sells for \$1,165.

MONOCOQUE

MONOCOQUE 90 is the designation of the latest product of Mono Aircraft Corp., Peoria, Ill. It is a two-place high-wing cabin monoplane, using the LeRhain R-265 90 hp. engine. Features are tapered wings, flaps, navigation lights, optional color combination, and high speed of 120 m.p.h. The price is \$3,375, and deliveries will be made after April 1.

Four other models are offered in production. The Monoway is a two-place dual control training plane, using Yale M5 engine, selling for \$2,835. Monocoque 65 is a sport model with the same engine, capacity and price. The Monoway, also two-place, uses Kinner or Warner Scarb engines and has orders higher production. The last model in the Mono line is the Monoway, a four-place dual control plane with Wright J-6-7 engine, selling for \$5,250. Its high speed is 135 m.p.h. and cruising speed 112 m.p.h. All of these machines are high-wing cabin monoplanes.

MOTH

MOTH AIRCRAFT CO., St. Louis, Mo., is offering for 1930 a sport sport edition of their well-known model, carefully streamlined with landrail, racing wheel shield, special undercarriage, enclosed front cockpit, etc. The front cockpit may also be left open and a detachable windshield fitted so that a parachute may be carried. There is a specially large baggage compartment. Color combination is optional, and the price at \$5,500. The standard model Moth is changed very little in appearance, but the fuselage has been strengthened by the use of

stronger tubing and additional bolt treatment, and there are a number of minor refinements. It sells for \$3,360 flyaway St. Louis, Mo., with Gypsy engine.

OSPREY

OSPREY AIRCRAFT CORP., Ingwood, Calif., will continue to produce the Osprey biplane, a six-place tri-engine cabin monoplane. This plane is powered with three six-cylinder in-line engines. It will sell for \$18,500, fully equipped including starter, wheel brakes and instruments. Production for the coming year will be centered on the Osprey, while design research will be started on a small three-engine amphibian of unique design, after its in-line engines.

The company also plans to continue production of its Conquest Wheel Gear. Many of these have been installed during the past year and it is expected that they will become increasingly popular this year.

PARKS

PARKS AIRCRAFT DIVISION of Detroit Aircraft Corp. is manufacturing for general sale these models of the three-passenger training plane which was developed for the use of Parks Air College. The price is \$3,115 with OX-5 engine, \$6,000 with Aushon, and \$6,350 with Wright J-6 165 hp. engine. The machine is a single-engine open cockpit biplane, of conventional construction. It is now being manufactured in plant No. 4 of the Detroit Aircraft Corp., Detroit.

PHEASANT

PHEASANT AIRCRAFT CO., Fond du Lac, Wis., will have two models of the Pheasant Trainer in production this year. The one-place cabin model will sell for \$2,495, and the two-place cabin plane will sell for \$1,795. Both of these ships are monoplanes and are powered with Wright engines manufactured by the company in its own plant.

PENTO

THE NEW MODEL PENTO is manufactured by Pento Aircraft Corp., Minneapolis, Minn. It is a two-place, open cockpit, tandem, low-wing monoplane, designed and built to suit needs of private owners and aviation schools. Manufacturing program for 1930 has not yet been completed, but announcement is expected shortly. A tentative list price of \$5,000 has been set on this model. This price will include brakes and other special accessories and equipment.

The plane is Kinner powered, and is equipped with springs to take Edo pontoons or skis without changes to the airframe structure. For training purposes the front cockpit is equipped with controls, rudder adjustment, mechanism, inclinometer, oil pressure gauge. The rear cockpit has all motor instruments, compass, pitch indicator, air speed indicator, starter, pressure gauge, and release handle.

PETCAIRN

PETCAIRN AIRCRAFT, INC., Willow Grove, Pa., will produce improved models of their standard sail planes during 1930. The principal changes in the new model are the use of novel wing type and a new type of land wheel. A sport model will also be produced for

private use. It will be a two place open cockpit biplane. For solo flying the second cockpit may be folded over.

PRUDEN-WHITEHEAD

ALBANY AIRCRAFT CORP., Atlanta, Ga., will produce a plane for 1930 the Pruden-Whitehead plane. This plane may be used as a transport, for executives, or for wealthy sportsmen. It is an eight-place, tri-winged, all metal, low-wing monoplane. At present, no price for this plane has been announced.

RYAN

A NEW RYAN DE LUXE MONOPLANE is featured this year by Ryan Aircraft Corp., St. Louis, Mo., powered with a Wasp engine and selling for \$65,000. Like the standard model S-5 brought in, priced at \$12,250 with Wright J-6 300 hp. engine, the new model S-7 has plans for six. The company is also bringing out the Fourteen, a smaller plane of similar design, powered with a Wright J-6 225 hp. engine and priced at \$10,000. The Ryan factory at present has a capacity of twelve planes per month.

SCOUT

POSITIVE AIR INVESTMENTS, Los Angeles, Calif., will continue to produce the Scout monoplane. Three models in all will be built: The two-place Scout Junior, will sell for \$1,450; the four-passenger Scout Senior, will sell for \$2,400; while the Scout cruiser for pilot and six passengers will sell for \$4,300. These prices do not include engines.

SIKORSKY

SIKORSKY AVIATION CORP., Bridgeport, Conn., will continue production of the S-38 during 1930. This amphibian, using two Pratt & Whitney Wasp engines, is being widely sold throughout North and South America and the Hawaiian Islands. It is an eight- to ten-passenger, tri-winged machine, and is equipped with all known Sikorsky features.

A new project to be undertaken by the company in the S-40, the largest amphibian in the world, which will be powered with four Pratt & Whitney Hornet Series B engines. Two of these have been ordered by Pan-American Airways for service between Miami, Fla., and Cristobal, Panama. The S-40 will be approximately twice the size of the S-38, and is designed to carry 41 passengers.

STINSON

SIX MODELS will make up the 1930 line of Stinson Aerospace Corp., Detroit, Mich., division of the Cessna Corp. All are open cockpits. The feature model is the Stinson-Detrouer Junior, slightly modified from the 1929 version, equipped with Lycoming K-680 210 hp. engine, priced at \$5,775. The Junior is also available with Wright J-6 225 hp. or 300 hp. engines. Equipment includes tailspin starter, metal propeller, and Kelsey-John wheels and landing gear.

Two models are offered in the Stinson-Detrouer Senior type. This is a six-place plane with Wright J-6 300 hp. or Wasp 425 hp. engines. These are priced at \$10,495 and \$15,095 respectively. The overall dimensions

of the Wasp model are considerably larger than those of the Wright-powered plane, though the passenger capacity is the same.

The Stinson Co. is also about to introduce a ten-passenger transport plane, powered with three 210 hp. Lycoming engines, to sell for \$25,000.

SPARTAN

SPARTAN AIRCRAFT CO., Tulsa, Okla., will produce three models for 1930. The first is a three-place open biplane equipped with a seven-cylinder Conquest engine, will sell complete for \$5,675, the second, a C-3-165 model with a five-cylinder Wright engine, will sell for \$5,595. The last of the line, the C-3-225 model, powered with a seven-cylinder Wright engine, will sell for \$7,750. Spartan has also in preparation a four-place dual-control cabin monoplane equipped with a seven-cylinder Wright engine which has a wing span of 50 ft. This plane will sell for about \$10,000.

SWALLOW

TWO ENTIRELY NEW MODELS for 1930 are now being built by Swallow Airplane Co., Wichita, Kan. A four-place low-wing cabin monoplane is expected to be ready for production by some time in May, and a five-passenger model is to be ready soon after that. These are three-place open biplanes built to use Kinross or Warner Scarab engine in the Junior model, and Wright J-6 225 hp. engine for the Senior model. In addition to these new planes, the Swallow company will continue to build the well-known TP biplane, carrying Cox-5, Kinross or Warner Scarab engine, with price ranging from \$3,135 to \$4,600; and the Commander, selling for \$3,250 with Hino engine and \$5,550 with Anzovin engine.

TAYLOR

TAYLOR BASS AIRCRAFT CORP., Bradford, Pa., will raise two planes in production during 1930. The first is a training plane powered by a Kinross K-5 engine but at \$5,675, equipped with dual control. The second, a sport machine, also powered by Kinross, lists at \$4,590, equipped with better, brakes, dual control and instruments. The company also has in the air four place plane powered with a Wright J-6-3 ready for government test about July 1.

TRAINAIR

MORRIS & BROS., INC., Buffalo, N. Y., will put into production during 1930 a new "Trainair," powered with a Kinross engine and priced at \$4,075.

The company will also continue to manufacture three-place open biplanes with Anzovin Kinross Wright J-6 165 hp. or 225 hp. engines. In addition, there is a new model with a 140 hp. Anzovin, and minor modifications in design.

TWOLE

TWOLE AIRCRAFT CO., INC., of Detroit, Mich., for 1930 introduces five plane amphibians and eight-place flying boats. They are both of open construction, Albatross being built throughout. The planes are powered with two Wright engines of 225 hp. each, located above the metal

wings. These wings are of full auxiliary construction. Hubs are of the double type. The landing gear is a hydraulic, power-operated mechanism. In flying position the landing wheels are enclosed in the floats to decrease drag. A price of \$25,000 is placed on both of these planes.

TRAVEL AIR

TWO NEW MODELS have been announced by Travel Air Manufacturing Co., Wichita, Kan. A four place cabin monoplane, powered with Wright J-6 225 hp. engine, will be known as model 10-10. It is essentially similar to model A-6 and 6,000 lb., powered with Wasp and J-6 300 hp. engines respectively, which were produced last year. They will be continued, selling for

ALCO

THE ALCO GAS TORN CO., of Croydon, Calif., is at present developing two engines which they hope to put in production during 1930. The first of these, an opposed eight-cylinder engine of 671-cu. in. capacity, will be well adaptable to wing installation.

The second, a 460-cu. in. seven-cylinder model engine, with an overall diameter of 39 in., is now being built. It will be rated at 130 hp. at 1900 r.p.m.

AXELSON

SIXTH MONTH into a new factory at Los Angeles, Calif., Axelson Aircraft Engine Co. has a practical capacity of 300 engines per month. At present, however, only immediate orders are being filled. The company continues to concentrate on the model A7H seven-cylinder model, rated 150 hp. at 1,800 r.p.m. The price is \$2,000 at the factory. A feature recently introduced is the "porcupine head"—a special arrangement of cooling fins over the cylinder head. The engine has been given Approved Type Certificate No. 16.

BLISS

E. W. BLISS CO., of Brooklyn, N. Y., will produce their Jupiter engine during 1930. This engine, which officially delivers 325 hp. at 1900 r.p.m., will be produced in the direct, geared, and the supercharged models. All of these engines will be produced at various contracted rates.

CENTURY

CENTURY RECENT MOTORS CORPORATION, of Cambridge, N. Y., will start manufacturing the Century 4-cylinder 100-hp. 1950 r.p.m. air-cooled engine. This engine has a bore of 4 1/2 in. and a stroke of 3 in. Its displacement is 418 cu. in. with a compression ratio of 5.5 to 1.

Standard equipment on this engine will include an automatic supercharger, electric starter, generator, and

\$16,500 and \$13,500; the price of the new model has been announced as being \$4,495.

WACO

SIX WOMEN will contribute the line offered by Waco Aircraft Co., Troy, Ohio, for the coming season. OX and Hino models will not be changed, and practically no changes have been made in the plane using Wright 165 hp. engine. There will be minor refinements in the Wright J-6 225 hp. straight wings and Taper wings. In addition to continuing production of these widely known machines, the company will introduce a new three place model using a 100 hp. air-cooled engine, and featuring Bendix wheels and brakes, with a tail-wheel instead of tail. No price changes have been announced.

Engines

two Scintilla magnetos, with an overhead cam drive. The production schedule is two units per day, from the first day of May, 1930.

BROWNBACK

THE LIGHT MANUFACTURING AND FORMING COMPANY has completed their program as originally outlined. The plant is operating daily and production is a quality production basis is proceeding. At present two engines per day of the five engine per day capacity are being built.

CIRRUS

AIRCRAFT CIRRHUS ENGINEING, INC., Marysville, Mich. The American Cirrus engine will be continued in production throughout 1930 without change. Aside from the features that have already been incorporated in the American Cirrus the company does not expect to make further changes in the engine itself.

As an optional extra, the company will equip the American Cirrus engine with a De Palma supercharger. Another development of this company during 1930 will be the American Engine, which will be an inverted line engine. This engine will also be furnished with the De Palma supercharger as an extra.

The company will undertake during 1930 extensive research and development in gear reduction for the American Engine.

CHEVROLET

PRODUCTION of the "Chevrolet" four-cylinder inline, inverted, air cooled motor, built by the Chevrolet Aircraft Corporation of Buicktown, Maryland, will begin sometime during the early summer, probably during the month of June. Final experimental tests are now being run and the preparation of production tools are being completed. The number of engines to be produced in 1930 will depend a great deal of course on the demand, and general conditions within the industry.

The motor was very well received by the various manufacturers of aircraft at the show in St. Louis and

the company has every reason to expect a very nice volume of business.

Tests run on this motor since the St. Louis show have shown the power output of the Chevrolet motor to be in excess of previous estimates. At 2000 r.p.m. the output is 100 hp, and at 2100 r.p.m. it is 110 hp. The previous estimate was 90 to 100 hp at the same speeds.

ARTHUR CHEVROLET

THE COMPANY will develop two engines, a 4-cylinder and a 6-cylinder, which are inverted, air-cooled, radial engines. Both engines have a bore and stroke of 4½ in. The 4-cylinder has been rated at 90 hp by the Department of Commerce, after being put through the regular Department engine tests, and has an approved type certificate.

The 6-cylinder engine has not been offered to the Department of Commerce as yet, but will be very shortly.

The 90 hp rating is at 2000 r.p.m., but the engine will develop 130 hp, at 2,250. The weight will be approximately 340 lb.

COMET

THE COMET ENGINE CORPORATION, which offers the Comet 7 cylinder, air-cooled, radial engine, is now located in Madison, Wisconsin, and is completely equipped with new production machinery, jigs, dies, and fixtures, installed in a new, modern factory. Manufacturing operations on the Pacific Coast, where production of the engine was originally started, have been discontinued although service parts and personnel are still maintained at the old address.

The design of the engine remains essentially unchanged although minor refinements have been incorporated.

As a result of improved manufacturing economies and the simplified design of the engine, it has been possible to reduce the price list from \$5000 to \$3700 with corresponding reductions in cost prices to manufacturers.

Due to a slight improvement in the cast design, the manufacturers are applying to the Department of Commerce for a rating to 125 hp at 1,500 r.p.m. for this power plant.

DAYTON

CONSIDERABLE SUCCESS from the angle of production and sales, 1930 promises to be the most prosperous year the Dayton Aircraft Engine Company has ever known.

Although the Dayton Star Engine has been on the market for some time, the efforts of the company have been largely directed towards experimentation and perfection of this 4-in-line, air-cooled engine. The officials of the company have withheld large scale sale and production until their engine was given every test. Under the supervision of H. Don Williams, chief engineer, the Dayton Star has been tested and perfected. Mr. Williams now has charge of large production which is well under way.

The Dayton Star is of the 4-cylinder, air-cooled type, generating 110 hp at 1500 r.p.m. It has a granted Department of Commerce Certificate No. 11.

The engine is now being sold at \$750. Quantity production has made this reduction possible.

CONTINENTAL

AT DENVER the Continental Aircraft Engine Co., a subsidiary of the Continental Motors Corporation, is planning a vigorous production program for 1931.

Three model A70 engines have been running on break down tests for the last few weeks. Up to date, they have completed 25 percent of 25 hr. each of continuous running. These engines are operating at full throttle all the time.

While Continental is now in production on the model A70, their activities will not stop with the design. Design and experimental work are being continued on other models of various types and, when found adequate will be added to the present production.

GENERAL

GENERAL AIR MOTORS CO., SCRANTON, Pa., will produce five- and seven-cylinder, conventional, radial air-cooled, engines during 1931. The five-cylinder engine is rated at 180 hp at 1500 r.p.m. while the seven-cylinder engine is rated at 250 hp at 1500 r.p.m.

Both power plants have a 5-in. bore with a 5½-in. stroke. One of the special features of this engine is the valve arrangement. Two intake and one exhaust valve per cylinder actuated by a single intake and a single exhaust push rod, incorporates a unique valve design under the two intake rocker arms. Employment of a two-way intake pipe permits exceptionally low barrel and head temperatures.

Drawings, patterns, castings, dies and forgings are complete, with some machinery ready for production on the five-cylinder engine. Work on the seven-cylinder engine is progressing very rapidly. Many parts are interchangeable with the five-cylinder engine.

HURRICANE

HURRICANE MOTOR CO., INC., of Houston, Texas, will get into production on their new engine this year. Their production schedule calls for the manufacture of two engines per month. At present the officials of the company are waiting for the engine to receive an approved type certificate before undertaking further production.

This company will also build a few experimental glider engines during the coming year.

KINNER

THE THIRD QUARTER of the year 1929 marked the entry of the Kinner Airplane and Motor Corporation upon a program of quantity production, resulting in the shipment of a total of 857 5-3 100 hp engines during the year. In Jan. and Feb. of 1930, 42 engines were shipped out by the company, an increase with 14 during the same period in 1929. From present indications it is estimated that approximately 70 engines will be shipped in March, which will compare with 38 shipped during March, 1929.

Due to the great difficulty which was encountered in securing the necessary automatic machinery, production

at the Kinner plant last year was delayed until the third quarter. Now the machinery has been installed. With its present equipment, the company is thoroughly capable of producing as many as 480 of the 100-hp engines and 160 of the 150-hp engines annually.

The production program for the year 1930 encompasses the production of 1,800 of the 100-hp engines and 500 of the new 150-hp engines. In the event, however, that a heavy sale of planes results in an increase in the demand for our motors over that which we have estimated, our production can be instantly increased upon very short notice and with practically no delay.

LAMBERT

THE LAMBERT ENGINE CO., for 1931, will produce two engines. They will continue production on their popular V-6 M-5, and will place in production their new Lambert Model R-366.

The V-6 M-5 is the engine which is now used quite extensively in the industry. This engine will be continued with minor improvements.

The new R-366 is a larger engine than the V-6 M-5, and has an overall diameter approximately the same as that of the V-6. The new R-366 incorporates many important mechanical principles. It will sell for \$1,450 f.o.b. the Moline, Illinois, factory.

LYCOMING

THE LYCOMING MANUFACTURING CO., of Williamsport, Pa., have a production program scheduled to start March 1. At the present time their factory is busied up to produce two engines per day. The Stinson Aircraft Corporation, another Cord subsidiary, have placed an order with this company for 500 of their engines.

Later in the year the company expects to announce production plans for a new seven-cylinder engine of the same size, their present engine being a six-cylinder radial air-cooled job developing 210 hp, at 2000 r.p.m. Officials of this company report that they are much encouraged over the outlook for the aviation production this year. They report that they firmly believe that those plane manufacturing companies that produce planes on a production basis, properly priced, will enjoy a satisfactory volume of business.

The company does not intend to announce any price on its engines, preferring to quote a price to each individual prospect according to the number of engines for which he will place an order.

MENASCO

MENASCO MOTORS, INC., Los Angeles, Calif., will continue production during 1931 on their "Piranha" engine. This engine is a four-cylinder, in line, inverted, air-cooled engine, rated at 90 hp, at 1800 r.p.m. by the manufacturer.

At the present time there are no figures or data obtainable on the company's plans for production during the coming year. No changes are anticipated in the engine.

MAC GLATCHEE

THE MACGLATCHEE MANUFACTURING CO., of Compton, Calif., will continue to build their "Purdue" engine. This engine is one of the L-head radial type. The engine

develops 150 hp, at 1,900 r.p.m. and has an overall diameter of 36 in.

The first series of a \$300,000 plant has been completed and has been completely stocked with the most modern tools. Starts his production on a large scale is planned for 1931.

The engine has completed its 50-hr. test in Washington, after an 80-hr. test flight will have an approved type certificate.

PRATT & WHITNEY

THE PRATT & WHITNEY AIRCRAFT CO., of Hartford, Conn., will build just an Army Wasp, Wasp Junior, and Junior B. Engines for the military demands. The company's present production schedule calls for 150 engines per month.

With production started on the new J-series, it is expected that number of engines built per month will rapidly increase.

SIEKELY

THE SIEKELY AIRCRAFT AND ENGINE COMPANY of Madison, Michigan, have been developing light, radial, air-cooled, aircraft engines for the past three years and, with the increasing interest in the development of a light, inexpensive plane of comparative low speed built around a low horsepower unit, this company has installed a special provision for the production of a large volume of light aircraft engines during 1931.

WARNER

RELUCTANCE on the part of aircraft companies to make large contracts for engine shipment at the time of the year is the experience of the Warner Aircraft Corporation, of Detroit, Mich. With the uncertainty that exists in the manufacturers' minds, they are placing orders for engines as they are needed from month to month instead of, as in the past, from year to year.

Due to these conditions, the Warner Aircraft Corporation is planning a substantial production for the year of 500 7-cylinder, 110 hp, "Scotch" engines. They are also planning a minimum production of 250 5-cylinder, 85-hp, "Scotch, Jr." Should the demand exceed this production, they have the facilities to increase their output as the demand arises.

WRIGHT

THE WRIGHT AERONAUTICAL CORPORATION of Patuxent, N. J., is planning for an increase of 15 to 20 per cent over their business in 1931. At the present time they report that contracts are coming in at a satisfactory rate, and the seasonal slack-up is under way.

Shipments for the first three months of 1931 have been exactly on the increase, which the company takes as evidence of the fact that aircraft are moving to the ultimate user, and that manufacturers are becoming more optimistic in spring orders are received. The Wright Co. are looking forward to a good business in their new 575-hp Cyclone engine during 1931, in addition to the 220-hp Cyclone on Government order for this year.

They expect to do an approximately even amount of business in the three divisions of their Warrenton class engines.

Announce Program Of French Air Events

PARIS (FRANCE)—The Sporting Committee of the Aero Club of France has issued a calendar of sporting events for this season as follows:

May 1—Start of seasonal competition for the Dewoit-Dunne trophy, closing Sept. 30. This event is open to light planes of the first and second categories, the prize going to the pilot scoring a 1,640-kilometer tour of France with an compulsory landing over a predetermined route in the quarter finale. It was won last year by Captain Hillairet in a Cessna 441 at a speed of 112.1 mph.

May 29 June 1—National contest for touring planes under auspices of Aero Club of Harcourt and Avignon.

May 31—Debut of supersonic plane at Neuves.

June 1—Debut of supersonic plane at Beauvais-lez-Dreux.

June 10—Annual national air meet at Vincennes.

June 20—Close of seasonal contest for Michelin trophy. This is a speed event over a 1,200-km. course through France, with fifteen compulsory stops, limited to planes with engines of 200 hp. or less. The first contest was won by M. Derrigny in a Morane-Saulnier 120 monoplane, fitted with a 230 hp. Saboteur, at 112.2 mph.

July 20—Close of 1958-1959 competition for the Renault trophy. This is awarded for the best one-stop distance flight in the competition period.

Pinkwich Bay in Mexico

MEXICO CITY (MEXICO)—Mexican Airlines and Continental and Fokker have announced flights from the date of their inauguration, July 26, to Dec. 31, 1959. The flights will be operated by the following aircraft: Fokker F-27, 127 passengers; Continental F-44, 127 passengers. The flights will be operated by the following aircraft: Fokker F-27, 127 passengers; Continental F-44, 127 passengers. The flights will be operated by the following aircraft: Fokker F-27, 127 passengers; Continental F-44, 127 passengers.

Plan International Glider Group

BERLIN (GERMANY)—As a result of the recent international glider championships, a group of glider pilots from various countries has decided to combine their activities and form a body under the name of "International Committee for Glider Pilots in Europe." The committee will be responsible for the development of glider sports in Europe.

Plan Air Mail Stamp Exhibit

PARIS (FRANCE)—An International Air Mail exhibition is to be held in Paris, Nov. 4-15. A special effort is being made to make the show only and will be sold to visitors in general and to the public. The exhibition is organized by the Aero Club of France, this city.

Private Air Yacht Built by Supermarine



THE SUPERMARINE flying boat has been built for the private use of A. E. Casson, who has done considerable traveling by air in other machines by his own. A description of this plane was printed in the March 15 issue of AVIATION. It was built by Supermarine Aviation Works, Ltd.

Foreign Briefs

Rate for flying instructors by Phillips and Frewin, London, England, has been raised to slightly less than \$10 per hour, with a book of vouchers for twelve 15-min. flights selling at \$25.15. The reduced charges are entrance fee or regular tuition.

At Hadda, the new port being developed in Pakistan, 200 acres of land have been purchased for use as an airport.

The first flying race of 1959 was held at Brooklands field, England, March 2, with about 40 planes participating. Lord Dillingham Club also recently held an informal meet near Guildford, with one German glider and one built from an American model, both of the primary training type.

Two valuable trophies for gliding have been won in England: one near Duns, near the coast, and the other at Kettlewell, near Lanchester. Herr Hirth, the German expert, recently made a flight of 7 hr. 30 min. at the latter location, in a Kassel airplane.

The airplane shot at Karachi, India, was captured March 8, and is ready for use by the Indian Air Force. It was captured by the Indian Air Force.

Loeb, Ouders, who is associated with the British Aviation Co., is said to have predicted an airplane crash tonight.

There are at present 160 glider clubs in Germany, 250 gliders and 60 winning gliders. There are 3,000 class A pilots, 1,000 class B pilots, and 300 class C pilots. The last classification being fully qualified for soaring.

There are now 75 hunting fields in French Indo-China, of which 25 have hunters.

A British supersonic with four 250 hp. engines, and four supersonic construction, intended to carry twelve passengers and a crew of three, has recently been built.

Douglas has ordered a silver medal from the Italian government for contributing a light plane altitude record to the Italian Air Force. The plane was built from Rome to Magdeburg via Trieste.

and Kristina, in northern Africa.

The airline from Genoa to Palermo via Rome and Naples will be operated only this season, and the Rome-Genoa-Berlin and Rome-Berlin-Athens-Constantinople lines will be operated seasonally.

A weather broadcasting station is being erected at Nizhny, Ceylon.

Regular night coach service between Brussels and London was to be inaugurated March 15 by Sabena.

A soaring team for the Grand Zepherus is to be created near Perpignan, France, but has been stopped by the French government.

German Luft Hansa has presented against an increase in the tariff on gasoline.

Thirty orders for Moth planes have been received by Messerschmitt-Bölkow, recently located in France. The first order was for a Moth plane.

Mlle. Lucie Desnoes, holder of the woman's distance record, plans to fly to Japan in a Fokker 190 cabin plane.

Experiments with delivery of air parcels will be possible as to be made in England.

Air races will be held Saturday, April 5, at Reading, England, and it is planned to have more at one or another airport every Saturday during the summer.

Air Marshal Sir Edward Ellington, K.C.B., C.M.G., C.B.E., has been appointed Principal Air Aide-de-Camp to the King of England.

Whitcomb Building New Scout

PARIS (FRANCE)—The Whitcomb company is constructing a two-seater, three-place, night reconnaissance plane of all-metal construction, and designated as type 220 R N. It is a monoplane with two engines along under the wing on either side of the fuselage on supports running between wing and undercarriage. The plane's engine is 100 hp. forward of the wing and observation and engine gear doors are in the nose and in the rear of the wing. Further details of 220 R N are each sent. The machine will have a span of about 80 ft.

Off Like a Bird— Swiftly and Smoothly— from a COLAS Runway

A faultless take-off—speedy and smooth—a short ground ride—into the wind—off in the distance. You find yourself in the air sooner—after covering less ground—when taking off from a COLAS runway.

Although the main airport use of COLAS is in the construction, repair and maintenance of Runways—Hangar Floors, Taxiways, Aprons and Roads within and surrounding the field are among its many other ideal uses.

Unconscious of mental attitude—the mental hazard in flying—is minimized with COLAS Runways at your local airport. They are MODERN—synonymous with the "Advancement of Aviation."

COLAS is an asphalt cement used to bind together the mineral aggregates used in the construction of the roadbed. It is applied cold—as delivered—thereby eliminating all heating costs and fire hazards.

COLAS surfaces neither "wave" nor "bleed" in hot weather. They will not "wash out" in rainy weather and they are unaffected by frost.

COLAS is ideal for airport surfaces.

Services

Application by COLAS Pressure Tank Truck is available for jobs requiring 1500 gallons or more. The services of a dedicated foreman are supplied with our charge. An Engineering Service is maintained to furnish you with advice and suggestions as to the manner in which COLAS will solve your problem whether it involves construction, resurfacing or repairing. This important service saves time, effort and expense and insures the best results.

If a smooth, light colored, firm and durable surface is desired COLAS is the answer to use.

Write for full information.

FLINTKOTE ROADS INC.

(COLAS LICENSEES)

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Building
NEW YORK

Park Square
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BOSTON

As installed on runway
at Beauvais-lez-Dreux



Photograph of airport equipped with COLAS Runways



A completed COLAS runway at Beauvais-lez-Dreux



COLAS before and after at Beauvais-lez-Dreux

ASSOCIATED
COMPANIES
Throughout the world





Magneto parts fused
of Bakelite material

SMALL PARTS—but how essential to safety

Interupt for an instant the steady flow of current from the magnetos, and engine performance falters. Halt it and the engine stops. In magnetos, insulation has a vital service to perform. It must confine the generated current to the conductors, must prevent all leakage under any conditions of temperature or atmosphere.

Bakelite Bakelite Moulded provides the high

insulation value demanded—because it is non-hygroscopic—is unaffected by temperature extremes—is unharmed by contact with oil and gasoline—and is a product of controlled uniformity. It's material is used by the leading builders of aircraft magnetos.

Manufacturers are invited to visit the cooperation of Bakelite Engineering Service. Write for Booklet 59-M, "Bakelite Moulded."

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BAKELITE CORPORATION OF CANADA, LIMITED, 113 Balfour Street, Toronto, Ontario

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THE MATERIAL OF A THOUSAND USES

A WINNER IN THE AIR

Many a flight has failed for the lack of an adequate rocker-arm lubricant. Until Texaco Marfak Grease came into the field, the lubrication of rocker-arm assemblies was a problem. Today there is this splendid lubricant. Prominent aviators who have tried it proclaim Texaco Marfak Grease to be the safe lubricant for this critical job. Engine manufacturers have tested it under the most trying conditions and have given their endorsement for its remarkable lasting qualities, efficiency as a lubricant and resistance to high temperatures.

Texaco Marfak Grease, long known for its good work in other fields, is now displacing other lubricants for enclosed rocker-arm assemblies and grease packed bearings in the air. Try it. Texaco Marfak Grease and the internationally well-known Texaco Aviation Gasoline and Airplane Oil, are available at the principal airports throughout the country.

THE TEXAS COMPANY
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PEDRICKS are approved and have been adopted by many of the nation's leading engine builders. They are used by private contractors operating trans-continental air mail lines, which furnish the most gruelling tests known in flying.

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Wilkening Manufacturing Co.
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Cornered!...the elusive match

SPALDING announces that Spalding Summer Flying Suits now have a special cigarette pocket on the left leg—a neat little pocket—put there expressly to hold your matches and cigarettes.

Don't get us wrong, gentlemen. We don't claim that this is any startling innovation in flying clothes. But...if you've ever dug your fingers into a large leg-pocket filled with cotton waste, a wrench, maps, papers, etc., and fumbled around trying to locate those blasted blank matches...

Then you'll appreciate the convenience of having matches and cigarettes always ready to hand in this trim little pocket.

And by the way, the *large* "billow" pockets



on Spalding Suits have been increased in size to 8 inches by 5 inches—giving you more room for various gadgets.

One particularly fine suit with the new pockets is our S-106. Made of sturdy, yet light Racine cloth, it is cool and comfortable. Tails are canvas and legs, and a long hoodless facer down the front.

It is styled a la overall, but styled so smartly, and with such an understated, that it looks "fly-in-oh," and not garage "attention-oh." Only \$20.00. Other suits with special cigarette pockets as low as \$10.00. Others as low as \$4.98.

See Spalding's equipment at any Spalding store, and at many leading flying fields. Or we will gladly send you the free catalog.

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AVIATION EQUIPMENT



Boeing installs the Airplane Telephone



12 Transceiver

Over the Sierras with Boeing, clouds hiding all but the highest peaks. "Weather clear, ceiling 3500 feet at Sacramento," comes a reassuring voice from far ahead.

Western Electric radio telephone equipment plays an important part in making Boeing service reliable. Forty-eight mail and passenger planes are fitted for two-way telephone communication with the company's eighteen ground stations.

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Western Electric equipment was selected by Boeing because it has been proved thoroughly dependable. Designed for remote control, receivers and transmitters are light, compact, accessible and easily installed.

For full details of apparatus for plane or ground installation, write to Western Electric Company, Dept. 246A, 195 Broadway, New York, N. Y.



24 Transceiver

Western Electric

Aviation Communication Systems



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MAKE YOUR AIRPORT PAY

YOUR Airport can be self-supporting if admission is charged and collected. That collection cannot be guaranteed unless your Airport is enclosed. With an Anchor Fence enclosure, all entrances and exits are controlled and nobody can gain admission without paying.

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"I've been over her from spinner to rudder, and she's O. K. Then, too, I've fueled her with Skelly Aerodynamic Gasoline and lubed her with Skelly Airplane Oil. It's a long run, but that ship will go on through."

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AERODYNAMIC
GASOLINE**

**SKELLY
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Hazards are reduced to a minimum in planes using Skelly products. Pilots know this by experience.

And mechanics know a plane sent out thus serviced, will return sane the worse for wear, no matter how long or hard the flight.



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Someone May Have
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THAT is why manufacturers of the country's most powerful, most dependable aeroengine engines use Allison Steel Back Bearings.

Lined with High Lead Bronze, Allison Bearings withstand the severe loads and strains imposed by mounting speed and motor power.

The development of this type of bearing is a monumental achievement in the field of Aero-Motive engineering.

Let us explain why. Write.

Allison Engineering Co.
INDIANAPOLIS, IND.





"There's a lot more flying left in *that oil* . . .
 . . . *it's Quaker State!*"

LONG, long after the ordinary oil reaches the shop-to-pieces point, Quaker State Aero Oil holds its tough, oily body—and keeps right on giving your motor that sweeter, slicker lubrication.

Quaker State lasts and lives longer because there's an extra quart of lubricates in every gallon of it—a whole quart more of friction-fighting lubrication than you get in the gallon of ordinary oil. The reason? Because of the way Quaker State Aero is made, the way it is refined.

Ordinary refining leaves in every gallon of oil, one quart or more that is of little or no value as a lubricant to your motor—it is little more than a quart of waste as far as lubrication is concerned.

But you don't get this waste in Quaker State, for Quaker State Aero Oil is super-refined—carried a step farther than ordinary oils. This extra step removes the quart of waste that ordinary refining

leaves in. In its place you get a quart of the finest lubricant—a quart more than you get in the gallon of ordinary oil—you actually get an extra quart in every gallon of Quaker State!

And—*mighty important*—every single gallon of Quaker State Aero Oil is made from 100% pure Pennsylvania Grade Crude Oil. There's no better—it's the finest the world produces!

Ask for Quaker State at your airport—and you'll get the sweetest lubrication you ever found for your motor, anywhere. It's remarkable how it makes its body. It will stand heat that would cripple an ordinary oil—it's the greatest aero oil that ever kept a motor out of mischief. Try it!



There is no Quaker State Petroleum company directly connected at 15 "A" and E. S. Y.—most in coast California Network

Get that extra quart in every gallon of

QUAKER STATE AERO OIL

TRADE MARKED U. S. PAT. 1927

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Other Pure Pennsylvania Products are:

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TRAVEL TIME OF 6 DAYS
 is cut to 6 HOURS—with a SIKORSKY AMPHIBION
*By air travel the Creole Petroleum Corporation exchanges days
 for hours across South America's oldest republic.*

The twenty-one which the "Coco" has made possible, after making the world's longest trip from Caracas, Venezuela, to Maracaibo, Venezuela, between these important cities, the Company must travel. Obviously the trip implies from six to ten days. In the Sikorsky Amphibion the time is cut to six hours.



The "Coco" Sikorsky Amphibion is a world's first amphibious aircraft. It is the only one of its kind in the world. It is the only one of its kind in the world. It is the only one of its kind in the world.



New world's machine records for altitude with load and speed with load were recently established with a Sikorsky.

"Coco," the Sikorsky Amphibion of the Creole Petroleum Corporation, is particularly well suited to the exacting duties assigned to her. Its loaded miles of momentary, principle and means require Maracaibo and Maracaibo, Venezuela. Between these important cities, the Company must travel. Obviously the trip implies from six to ten days. In the Sikorsky Amphibion the time is cut to six hours.

Exceedingly comfortable, the ship puts every hour of travel in the class of pleasure. And with her two and H. P. "Wing" engines she has greatest means of power, with ability to fly and maneuver on other ships. Her usual cruising speed is 110 miles an hour.

Lake, river and lagoons provide perfect landing fields for the "Coco," which is transformed from landplane to seaplane in a matter of seconds. The landing, as mentioned in a ship used in the Chinese lake country, is equally important in a ship for water use in the States. Many times when severe fields are made from business centers have suitable water landing fields close at hand.

Sikorsky Amphibions are proving themselves excellent investments in the service of business and industrial firms, transport lines and individuals. In a holder, naturally, would there are some rather interesting facts concerning the unusual advantages of the "Coco." May we send you a copy?



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When the fog hangs thick as pea soup or when darkness overtakes you, IDECO Radio or Lighted Beacon Towers guide you safely to your destination. IDECO Airway Towers are used exclusively on 90% of the lighted airways.

Fit companions of the Radio and Beacon Towers are IDECO Steel Hangars and Airport Buildings. With good flying weather at hand, get in touch with IDECO for your Airport Buildings and Equipment.

A catalog describing in detail the many outstanding features of IDECO Hangars and the various towers and other airway and airport equipment is yours for the asking.

Avoid delays—get this information at once.

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READY MADE STEEL HANGARS

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INDIVIDUAL FLYING SCHOOL COMMERCIAL AND AIRPORT PURPOSES



BUTLER



A new booklet pictures installation of Butler Ready-made Hangars. Butler engineering services will supply full information and prices if you will mention the also building in mind.

COMPLETENESS, economy in acquiring, economy in maintenance, fire safeness, speed in erection, appearance and structural qualities which make for permanence, yet which permit enlarging or taking down and re-erection—all these are Butler Ready-made Hangar characteristics. Their uses total in the common sense solution of the airplane sheltering problem.

Stones range from the large airport types with clear spans of 100 feet or more down to the individual T-shaped, round or gable roof hangars for any size airplane. Air stations along transport lines, flying school hangars and training quarters, plant buildings for aircraft factories, ground equipment and material warehouses and repair shops are some of the many other air industry purposes served by Butler Ready-made Steel Buildings. Butler designs include combinations of steel and stucco and steel and brick veneers.



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three large factories, a modern cutting plant, and nine branch offices strategically located from coast to coast. Immediate shipment of felt for any purpose . . . in any quantity, large or small . . . is thus assured.

Also prints—specifications—samples—and at one or all of them. We will then submit quotations and suggestions and advise you of any savings that might be effected.

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There is enough reserve mileage in every filling of Pennzoil to take you more than half way across the continent. Here are the figures:

Ordinary oils must be drained at 15 hours. Pennzoil may be used from 30 to 45 hours. In other words, Pennzoil gives you at least 15 extra hours with every filling.

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Use Pennzoil—and you'll never worry about lubrication trouble again!

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Unmistakable of the exactness of speed demands on machines in most phases, Axelson policies have never permitted hurried manufacture to interfere with quality requirements. Even though the Axelson plant has every facility for high speed production, each machine is caressed to perform each operation with deliberate care.

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By every test TP Aero Motor Lubricating Oil plainly demonstrates its superiority. It represents a great stride ahead in the science of lubrication. TP eliminates many causes of engine trouble—reduces the threat of flying.

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In terms of performance this means uniform viscosity at all working temperatures, minimum carbon deposit and ignition trouble from fouled spark plugs, easy cold starting, immediate oil pressure, perfect lubrication winter and summer, on the ground or at high altitudes—a maximum of safe flying hours.

A handsome, practical Pilot's Log Book sent free on request.

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MADE IN U. S. A.

1930

Thompson Valves from Famous Cylinders

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... from the "City of Cleveland"

Only valves of extreme accuracy and stamina could stand up under punishment like this! More than a week of rapid opening and closing — of cherry-red heat — of constant pounding on the valve seats!

Yet, after the 174-hour flight of the "City of Cleveland" in July, 1929, the Thompson Valves that helped set this record showed no evidence of deterioration. The unretouched photograph reproduced on this page shows two of them soon after the flight. Their condition is typical of the 18 Thompson Valves that flew with the "City of Cleveland."

Performance such as this in every test has influenced aero engineers to specify Thompson Valves. Today, Thompson Valves are used in 95% of all American aero engines.

THOMPSON PRODUCTS, INCORPORATED
General Office: Cleveland, Ohio, U. S. A.
Factories: CLEVELAND and DETROIT



Thompson Valves



Two Thompson Valves that helped make history. An exhaust valve and an intake valve taken from the "City of Cleveland" immediately after its famous flight.



CONTACT!

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an easier and more efficient
method of starting

PILOTS everywhere who enjoy the convenience and safety of electric starting find Exide Aircraft Batteries absolutely dependable for this job and many others.

These batteries can be relied upon to jump to their job with a surge of current or a steady, even flow, as may be required. Millions

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Not only do Exide Aircraft Batteries provide efficient, economical starting and ignition, but they also furnish dependable, steady current for landing, cabin and instrument board lights . . . navigation lights . . . and radio power.

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This light, compact Exide battery is especially built for engines with rapid air requirements.

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THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia
THE WORLD'S LARGEST MANUFACTURERS OF STORAGE BATTERIES FOR EVERY PURPOSE

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UNIVERSAL FLYERS, Washington, D. C.

Establish New Record in FORD TRI-MOTOR with GULFPRIDE OIL 120



UNIVERSAL FLYERS
WASHINGTON, D. C.

Gulf Refining Company,
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You will no doubt be interested in knowing something of the results that we have been obtaining through the use of GULFPRIDE OIL and GULF NO-SMOKE MOTOR FUEL in our Ford Trimotored Air-Postal Monoplanes.

As you know, our planes have been used to make an endurance tour, under the command of Paul Denier, throughout the country. The first one of our trips was started on September 1936, and in the first year, through the 15th of September 1937, made a world's record 24 plane and pilot, for the shortest number of passengers carried in any one airplane during a similar trip, being carried more than 25,000 people, made over 4000 take-offs and landings, and having flown during that period approximately 70,000 miles. The most important feature of the accomplishment, we feel, is the fact that every flight was completed safely and never once was it necessary to make a forced landing.

We have just overhauled the entire one for the third time - the total number of total flight hours being in excess of 900 - the cost of parts replaced at each overhaul was reasonably low, the parts used in this third overhaul totaling only \$300.00 for all three motors.

Our Mr. Ray Lester, formerly of the Ford Airport at Detroit, piloted this plane during the entire period and he, we feel, can assure you that this wonderful motor performance is due to a great degree, to the constant use of GULFPRIDE OIL and GULF NO-SMOKE MOTOR FUEL.

A greater number of the flights that we operated than had previously been made, and in day number our three motors flew us dozens of take-offs and landings. Then we were particularly glad for us because of the great number of take-offs and landings that we made each day, our average flight being 10 minutes. In spite of this hard service, however, we found that the motors were here down during each of the three overhauls. That alone was a decided indication of the great quality of the motor, and the fact that the bearings each time were in perfect condition and were at the third overhaul, did not show any appreciable signs of wear.

GULF

"GULFPRIDE OIL"

America's Finest Aircraft Oil"

GULF REFINING COMPANY

TODAY'S MOST EXACTING USER OF STEEL



THE BUILDER of airplane engines demands steel and forgings that conform to standards of quality far higher than were dreamed of a few years ago.

Require the tremendous power and speed, the light weight, the high degree of dependability on airplane engine must possess, and you are why the engine builder is today's most exacting buyer of steel. Naturally, he is willing to entrust the safety and reputation of his product only to steel and forgings of whose high quality and uniformity he is certain, beyond all doubt.

Bethlehem has supplied many tons of fine steel to builders of airplane engines. Out of this experience, constantly supplemented by painstaking study, has grown a new set of standards which govern at every step in the manufacture and inspection of Bethlehem Steel for the aeronautical manufacturer. Bethlehem Steel and Forgings made in accordance with these standards are

known as Steel and Forgings of "Airplane Quality."

The term Bethlehem "Airplane Quality" is more than merely a name. It stands for the strongest and most dependable steel for the specific task that unexcelled facilities and long experience can produce. You can entrust the safety and reputation of your product with entire confidence to Bethlehem "Airplane Quality" Steel and Forgings.

Bethlehem "Airplane Quality" Steel and Forgings will be on exhibit at the All-American Aircraft Show, Detroit, Space No. 14, Regatta Annex.

BETHLEHEM STEEL COMPANY

General Offices: Bethlehem, Pa.

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"AIRPLANE QUALITY"

STEELS • FORGINGS

NO OTHER PART OF AN AIRPLANE IS MORE PRECISION-BUILT

THE cylinder of Aerial Military Struts are machined in one piece from a single chrome-nickel-steel extruded or tube forged specially heat-treated in modern electric furnaces under pyrometer control. The possibility of flaws in the metal or errors in heat-treating are eliminated.



THE finished cylinder is exactly machined to rigid limits. One one-thousandths of one inch is the maximum tolerance allowed, and rigid inspection prevents the passing of any cylinders not meeting these requirements.

THE piston assembly also represents the highest quality of materials and workmanship. The piston is made from special chrome-nickel-steel extruded or tube forged and the carefully fitted head is of slow-wearing gun steel. The special packing holds a perfect seal throughout years of active service.



THE finished strut combines fine materials, workmanship and superior design. No other type of landing-shock absorber can equal the operating efficiency and long life of these struts. That is why there are more Aerial Struts in use today than any other make.



BUILT BY THE CLEVELAND PNEUMATIC TOOL CO., CLEVELAND

AEROL STRUT

shock absorbing

ARE YOU losing revenue because planes are unable to land or take off your runways in wet weather? *Tarmac surfaces soon pay for themselves.*

Are you losing money in parking fees because you have no surface on your parking areas? *Tarmac surfaces soon pay for themselves there.*

Are you losing possible patronage because there are no adequate all-weather approach roads to your airport? *Tarmac soon pays for itself there.*

Surface

RUNWAYS
PARKING AREAS
HANGAR APRONS
CONNECTING ROADS
TAXI STRIPS

at moderate cost
with

Tarmac

This matter of airport surfacing has to be decided with a knowledge of its effect on a field's revenues. Canton-Bettie Field, near Pittsburgh, laid Tarmac-surfaced runways last fall, and for the first time kept the field in constant uninterrupted operation throughout the winter . . . with air mail in and out every day and night, with 3,000 passengers handled in seven fall and winter months, with many private planes selecting the field as their base of operations.

Surface your field with Tarmac . . . it will soon pay for itself. Write for information on Tarmac for airport paving.

AMERICAN TAR PRODUCTS COMPANY

Division of The Republic Company
GENERAL OFFICE: PITTSBURGH, PA.

Chicago, Ill.
Birmingham, Ala.
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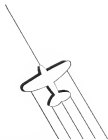
El Paso, N. M.
Birmingham, Ala.
Houston, O.

Phoenix
Pittsburgh, Pa.
New York, N. Y.
St. Paul, Minn.

Philadelphia, Pa.
St. Louis, Mo.
New Haven, Conn.

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PRECISION BUILT . .

There are 4 cardinal points of practical aircraft power. They are dependability, economy, convenience and smoothness. All result from the same basic fundamental of construction—precision. Continental has entered the aeronautical field with the unalterable purpose of building the best aircraft engines in the world. They are Precision Built. Continental is producing Practical Aircraft Power.

"Approved Type Certificate No. 33, U. S. Department of Commerce"

CONTINENTAL AIRCRAFT ENGINE CO.
General Office and Factory: Detroit, Michigan

Continental Engines



Drawing upon the facilities and experience of the greatest engine builder in the world, Continental is uniquely equipped to attend with the trade in the design and production of engines to fit individual requirements.



WHEN HOURS OR MINUTES *mean dollars to you*

EMERGENCIES develop suddenly! You may require materials for a motor repair job at once. To finish an extension on time, you need more wiring materials. Again, an unexpected decision to increase production requires mufflers and MAGNA lamps immediately. More than one department or a few individuals are concerned, for unless you secure materials promptly, your entire production schedule may be affected.

In emergencies such as these... when hours or minutes mean dollars to you... the ample, readily accessible stocks of the General Electric Supply Corporation assure quick deliveries.

The General Electric Supply Corporation consists of more than 100 wholesale warehouses, strategically located throughout the United States. All commodities are supplied within a few hours—and many are stored in inventory. No electrical distributor's in-

ventory anywhere can give more prompt shipping service.

Thus the General Electric Company has taken another forward step to meet the nation's fast-growing electrical requirements. The General Electric Supply Corporation, utilizing the experience of the oldest and largest electrical manufacturing organization in the world, enables you to secure supplies and materials exactly when you want them. When you have an electrical need—write!



... to serve better the electrical needs of America.

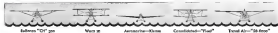
See us in the General Electric Store, broadcast every Saturday morning, over a nationwide R. B. C. network.

GENERAL  ELECTRIC
SUPPLY CORPORATION

GENERAL OFFICES

BRIDGEPORT, CONNECTICUT

EDO ALLY OF AIRPLANE QUALITY



THERE is no reason for gambling on float equipment when proved superiority is right at hand. An overwhelming majority of the floats on all types of commercial planes are made by EDO. The standard float equipment of Western Canada Airways, who fly over half of the total Canadian mail and freight, is EDO. The U. S. Department of Commerce has licensed over twenty different types of seaplanes with EDO floats—more than all other manufacturers combined. EDO floats must be good to merit such universal choice!

Every EDO installation is the substantial total of all desirable float features. Check these outstanding points: Entirely of metal, a single, homogeneous unit that will not rot, shrink nor absorb water—"Alclad" metal sheeting, proof against corrosion—exclusive and patented fluted bottoms for rigidity and quick



take-off—water-tight bulkheads every two feet for buoyancy in spite of severe damage—extra heavy keels to permit sliding about without cradles—heavy side sheets to eliminate complicated internal bracing—flat decks with upstanding, riveted side seams to give secure footing and permit easy removal for overhaul—a shallow trim for easy taxiing and backing well up on a runway.

EDO floats are designed and built by an organization devoted exclusively to seaplane installations. EDO engineering is backed by years of experience. Airplane manufacturers and operators may be sure that their planes, EDO-equipped, will give perfect performance as seaplanes. Entire float installation problems can be presented to EDO with the assurance of their ready, thorough and positive solution. EDO cooperation is cordially extended to all who have not yet availed themselves of it. Address—EDO Aircraft Corporation, 630 Second Street, College Point, L. I.



EDO
THE FLOAT MAKERS

Pick Your Ship From these Remarkable Used Plane Bargains

Every ship licensed for passenger carrying—every ship inspected, put in good flying condition and certified by Curtiss-Wright. Many of these are pink-of-condition "demostrators." Your choice on easy payment terms. For prompt and complete cooperation, wire or write without delay to Curtiss-Wright Flying Service bases listed below, or to 27 West 57th Street, New York.

CURTISS-WRIGHT For Your Protection:

1. Accepts in trade only *tested* aircraft and engines.
2. Sells used equipment only when it is *soundly*.
3. Examines every used plane and engine—gives title to airplane and engine receipt on its condition.
4. Issues an inspection certificate with every sale.

MAKE	TYPE	ENGINE	NO. IN	MOORE	PRICE	BASE
Curtiss	4 pl. Catalina	100 Whetstone	NO. 201 M	12	\$1,450	Miami
Curtiss	4 pl. Catalina	100 Whetstone	C 100-10	21	1,475	Albany
Curtiss	4 pl. Catalina	100 Whetstone	NO. 100-10	9	1,300	Cincinnati
Curtiss	4 pl. Catalina	100 Whetstone	NO. 100-10	4	1,000	Dallas
Curtiss	4 pl. Catalina	100 Whetstone	C 100-10	107	1,115	Los Angeles
Curtiss	4 pl. Catalina	100 Whetstone	NO. 100-10	38	1,000	Valley Stream
Curtiss	4 pl. Catalina	100 Whetstone	C 100-10	24	1,150	Los Angeles
Curtiss	4 pl. Catalina	100 Whetstone	C 100-10	34	1,150	Chicago
Curtiss	4 pl. Catalina	100 Whetstone	C 100-10	35	1,150	Dallas
Curtiss	4 pl. Catalina	100 Whetstone	C 100-10	36	1,150	Dallas
Curtiss	4 pl. Catalina	100 Whetstone	C 100-10	37	1,150	Dallas
Curtiss	4 pl. Catalina	100 Whetstone	C 100-10	38	1,150	Dallas
Curtiss	4 pl. Catalina	100 Whetstone	C 100-10	39	1,150	Dallas
Curtiss	4 pl. Catalina	100 Whetstone	C 100-10	40	1,150	Dallas
Curtiss	4 pl. Catalina	100 Whetstone	C 100-10	41	1,150	Dallas
Curtiss	4 pl. Catalina	100 Whetstone	C 100-10	42	1,150	Dallas
Curtiss	4 pl. Catalina	100 Whetstone	C 100-10	43	1,150	Dallas
Curtiss	4 pl. Catalina	100 Whetstone	C 100-10	44	1,150	Dallas
Curtiss	4 pl. Catalina	100 Whetstone	C 100-10	45	1,150	Dallas
Curtiss	4 pl. Catalina	100 Whetstone	C 100-10	46	1,150	Dallas
Curtiss	4 pl. Catalina	100 Whetstone	C 100-10	47	1,150	Dallas
Curtiss	4 pl. Catalina	100 Whetstone	C 100-10	48	1,150	Dallas
Curtiss	4 pl. Catalina	100 Whetstone	C 100-10	49	1,150	Dallas
Curtiss	4 pl. Catalina	100 Whetstone	C 100-10	50	1,150	Dallas
Curtiss	4 pl. Catalina	100 Whetstone	C 100-10	51	1,150	Dallas
Curtiss	4 pl. Catalina	100 Whetstone	C 100-10	52	1,150	Dallas
Curtiss	4 pl. Catalina	100 Whetstone	C 100-10	53	1,150	Dallas
Curtiss	4 pl. Catalina	100 Whetstone	C 100-10	54	1,150	Dallas
Curtiss	4 pl. Catalina	100 Whetstone	C 100-10	55	1,150	Dallas
Curtiss	4 pl. Catalina	100 Whetstone	C 100-10	56	1,150	Dallas
Curtiss	4 pl. Catalina	100 Whetstone	C 100-10	57	1,150	Dallas
Curtiss	4 pl. Catalina	100 Whetstone	C 100-10	58	1,150	Dallas
Curtiss	4 pl. Catalina	100 Whetstone	C 100-10	59	1,150	Dallas
Curtiss	4 pl. Catalina	100 Whetstone	C 100-10	60	1,150	Dallas
Curtiss	4 pl. Catalina	100 Whetstone	C 100-10	61	1,150	Dallas
Curtiss	4 pl. Catalina	100 Whetstone	C 100-10	62	1,150	Dallas
Curtiss	4 pl. Catalina	100 Whetstone	C 100-10	63	1,150	Dallas
Curtiss	4 pl. Catalina	100 Whetstone	C 100-10	64	1,150	Dallas
Curtiss	4 pl. Catalina	100 Whetstone	C 100-10	65	1,150	Dallas
Curtiss	4 pl. Catalina	100 Whetstone	C 100-10	66	1,150	Dallas
Curtiss	4 pl. Catalina	100 Whetstone	C 100-10	67	1,150	Dallas
Curtiss	4 pl. Catalina	100 Whetstone	C 100-10	68	1,150	Dallas
Curtiss	4 pl. Catalina	100 Whetstone	C 100-10	69	1,150	Dallas
Curtiss	4 pl. Catalina	100 Whetstone	C 100-10	70	1,150	Dallas
Curtiss	4 pl. Catalina	100 Whetstone	C 100-10	71	1,150	Dallas
Curtiss	4 pl. Catalina	100 Whetstone	C 100-10	72	1,150	Dallas
Curtiss	4 pl. Catalina	100 Whetstone	C 100-10	73	1,150	Dallas
Curtiss	4 pl. Catalina	100 Whetstone	C 100-10	74	1,150	Dallas
Curtiss	4 pl. Catalina	100 Whetstone	C 100-10	75	1,150	Dallas
Curtiss	4 pl. Catalina	100 Whetstone	C 100-10	76	1,150	Dallas
Curtiss	4 pl. Catalina	100 Whetstone	C 100-10	77	1,150	Dallas
Curtiss	4 pl. Catalina	100 Whetstone	C 100-10	78	1,150	Dallas
Curtiss	4 pl. Catalina	100 Whetstone	C 100-10	79	1,150	Dallas
Curtiss	4 pl. Catalina	100 Whetstone	C 100-10	80	1,150	Dallas
Curtiss	4 pl. Catalina	100 Whetstone	C 100-10	81	1,150	Dallas
Curtiss	4 pl. Catalina	100 Whetstone	C 100-10	82	1,150	Dallas
Curtiss	4 pl. Catalina	100 Whetstone	C 100-10	83	1,150	Dallas
Curtiss	4 pl. Catalina	100 Whetstone	C 100-10	84	1,150	Dallas
Curtiss	4 pl. Catalina	100 Whetstone	C 100-10	85	1,150	Dallas
Curtiss	4 pl. Catalina	100 Whetstone	C 100-10	86	1,150	Dallas
Curtiss	4 pl. Catalina	100 Whetstone	C 100-10	87	1,150	Dallas
Curtiss	4 pl. Catalina	100 Whetstone	C 100-10	88	1,150	Dallas
Curtiss	4 pl. Catalina	100 Whetstone	C 100-10	89	1,150	Dallas
Curtiss	4 pl. Catalina	100 Whetstone	C 100-10	90	1,150	Dallas
Curtiss	4 pl. Catalina	100 Whetstone	C 100-10	91	1,150	Dallas
Curtiss	4 pl. Catalina	100 Whetstone	C 100-10	92	1,150	Dallas
Curtiss	4 pl. Catalina	100 Whetstone	C 100-10	93	1,150	Dallas
Curtiss	4 pl. Catalina	100 Whetstone	C 100-10	94	1,150	Dallas
Curtiss	4 pl. Catalina	100 Whetstone	C 100-10	95	1,150	Dallas
Curtiss	4 pl. Catalina	100 Whetstone	C 100-10	96	1,150	Dallas
Curtiss	4 pl. Catalina	100 Whetstone	C 100-10	97	1,150	Dallas
Curtiss	4 pl. Catalina	100 Whetstone	C 100-10	98	1,150	Dallas
Curtiss	4 pl. Catalina	100 Whetstone	C 100-10	99	1,150	Dallas
Curtiss	4 pl. Catalina	100 Whetstone	C 100-10	100	1,150	Dallas

Additional slightly used demonstrators of the types manufactured by Curtiss-Wright—Robins, Travel Air, Moth and others—are now on sale at various Curtiss-Wright branches throughout the country. Full descriptions and prices will be sent on request.

CURTISS-WRIGHT FLYING SERVICE
DIVISION OF CURTISS-WRIGHT CORPORATION

"World's Oldest Flying Organization"

PRECISION AIRCRAFT ENGINE PARTS



Ex-Cell-O Supplies Milled Thread Parts to the Leaders in the Aircraft Industry

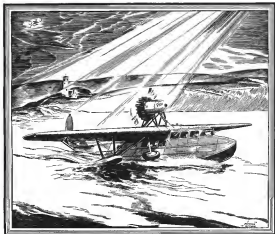
When studs, screws, and bolts made of steel are used in conjunction with softer metal such as aluminum, there is a constant danger that threads which are die cut will re-up the tapered hole. This danger is eliminated when threads are milled accurately.

Ex-Cell-O is equipped for the production of milled thread parts of more than usual accuracy. It has long been Ex-Cell-O practice to pickle all material going into crankshaft and crankcase through bolts, thereby eliminating any chance of defective material getting into these highly stressed parts.

Ex-Cell-O also manufactures precision gear pinions, cone followers, roller guides, automatic printing machine products and many others. All Ex-Cell-O aircraft parts are manufactured to manufacturers' specifications. Illustrated aircraft bolts will be mailed upon request.

Visit Ex-Cell-O at the A.I.E. Show—
Aircraft Division
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1220 OAKMAN BOULEVARD • DETROIT



THE AMPHIBION THAT GAR WOOD SELECTED

WHEN Gar Wood, aircraft power boat racer and manufacturer, selected a Fokker Amphibian for his personal use, he put a high tribute indeed to the performance of the plane, and the virtues of its build.

Powered with a Wright 225 h. p. Cyclone or Pratt & Whitney 575 h. p. Hornet motors, Fokker Amphibians have a high speed of 112 m. p. h., and a cruising speed of 95 m. p. h. Bigged on flying boats, they have a high speed of 120 m. p. h. For transport or personal use, these ships are also provided with two motors. In considering these ships, prospective purchasers will be interested to learn that Fokker has built more airplanes than any other manufacturer in the world, that Fokker planes have made twice as many great pioneering flights as any other make of plane, and that Fokker planes have flown over 25,000,000 miles as transport lines, establishing a record for safety that has never been approached. Because of economies due to production principles of

General Motors, planes are probably less than you might expect. Terms may now be arranged on the G.M.A.C. Finance plan to suit your convenience.

For the use of business executives, for pleasure, and for sports activities, Fokker now makes six different models of amphibian—single and multi-engine types. Boat planes, sea planes, flying boats, amphibians. Inquire for references or illustrations. We insist, and will be promptly answered. Fokker Aircraft Corporation of America, General Motors Building, New York.

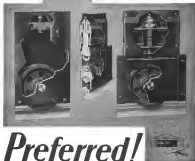
FOKKER

AFFILIATED WITH GENERAL MOTORS CORPORATION

R-W hangar door hardware...

50
Years

R-W letters indicate the strength (1944-1950) data on "standard strength" and standard aircraft steel and wood doors are in R-W. The steel door plates are colored white with no springs or other aircraft parts in R-W or gold and silver.



Preferred!

Wherever hangar doors are made and installed, R-W hardware is preferred. That's because each unit, each hidden part, is specially designed to provide smooth sliding and continued easy, trouble-free operation.

Ask your architect, your engineer, your door manufacturer. Consult an R-W engineer; counsel with him from the first planning stage. Write for catalog No. F-62.

Richards-Wilcox Mfg. Co.

"A HANGER FOR ANY DOOR THAT FLIES!"

AMERICAN MANUFACTURING CO.

Distributors: New York, Chicago, Boston, Philadelphia, Cleveland, Cincinnati, St. Louis, New Orleans, San Antonio, Houston, Kansas City, Los Angeles, San Francisco, Seattle, Portland, Sacramento, Richmond, Wichita, Greenville, S.C., Ltd., London, Ont., Montreal, Winnipeg.



Richards-Wilcox
Mfg. Co.

Share WACO Success



IF THE THOUSANDS OF READERS of this publication, there are not over a dozen men to whom this message is directed. To these few WACO offers an unusual opportunity.

Finishing the year 1937 with no surplus production and with a most favorable financial statement... with no merging alliances and with the consequent advantage of flexibility and independence of action... WACO is in an enviable position this season, and offers corresponding advantages to the WACO distributing organization.

Likewise in the character and ability of its distributing organization, WACO is unusually favored. But there are still a few territories which offer splendid opportunity for immediate and future profit, to a select few individuals who can measure up to WACO standards, who can qualify for the WACO franchise.

Proven business ability... a record of successful salesmanship... personal longevity, of course... moderate but adequate finances... vision and enthusiasm for the possibilities in the aviation industry... capacity and inclination for consistent, intelligent, vigorous effort... these are the essential qualifications in the men to whom this opportunity is offered. Ability as a pilot is of secondary importance. It is desirable but can be readily acquired.

It is significant that the distributor who took delivery on the first WACO ever built is still numbered among the most loyal and enthusiastic WACO representatives... that a distributor located in a relatively unfavorable Eastern city disposed of fifty WACOs last year... that another distributor in a Mid-West territory has steadily increased sales year after year until he sold over a hundred WACOs... that the loyalty and stability of the WACO field organization is backed upon firm policies and uniform fair dealing... that adequate and fair dealer discounts consistently result in satisfactory net profits to WACO dealers.

If you are interested we would be pleased to discuss the matter with you in detail.

THE WACO AIRCRAFT COMPANY, TROY, OHIO.



"SEEK ANY PILOT"

And now

SAVOIA
MARCHETTIis
HEYWOOD
EquippedSTARTER
by
HEYWOOD

American Aeronautical Corporation
"The World's Standard"
 110 Hudson Street, New York, N.Y.

The Heywood Starter,
 Model 100

All Heywood starters that operate on any engine with normal rotation and on four stroke and six stroke engines.

All Heywood starters, of course, operate on any engine with normal rotation and on four stroke and six stroke engines.

All Heywood starters are built to the highest standards of construction and are built to the highest standards of construction.

See your dealer.

AMERICAN AERONAUTICAL CORPORATION

By *Heywood Starter*
 Registered Patent



The greatest of all lubricants—inherently use—again given the Heywood Starter.

Because of its consistent dependability under all climatic conditions, its automatic, never-failing operation, the Heywood Starter has been adopted as standard equipment by the American Aeronautical Corporation, for the Savoia Marchetti 56.

Shown above is one of the New York Police Department planes. Service to which this plane is put calls for instant and positive response to demands on the starter, and for this reason Heywood has the unequalled commendation of the pilots for this department.

Complete details on request.

SKY SPECIALTIES CORPORATION
 3451 First Avenue • Detroit, Michigan

speaking of *Records..*

THE "WASP" GATHERS IN SIX MORE

LEE SHOENHAIR has just established six new world's speed records for class C airplanes. He flew the "Wasp" powered Lockheed Vega monoplane "Miss Silvertown," owned by the B. F. Goodrich Rubber Company. These new marks are as follows:

WITH 1000 KILOGRAMS LOAD

1. Distance of 100 kilometers at 175.997 miles per hour
2. Distance of 500 kilometers at 166.114 miles per hour
3. Distance of 1000 kilometers at 152.702 miles per hour

WITH 500 KILOGRAMS LOAD

4. Distance of 100 kilometers at 165.42 miles per hour
5. Distance of 500 kilometers at 171.236 miles per hour
6. Distance of 1000 kilometers at 152.702 miles per hour



Recognition by the Federation Aéronautique Internationale of these new records will credit the United States with 25 motor flight, however than six world's records. Pratt & Whitney will hold 12 of these, or more than half of this country's heaviest than six records, and three times as many as are held by any other American aeronautical engine manufacturer.

Not only in the establishment of world's records, but in the everyday carrying of mail, passengers and express, "Wasp" and "Hornet" engines are demonstrating their dependability which comes only with proven design and conservative financing.

THE
PRATT & WHITNEY AIRCRAFT CO.
 HARTFORD • CONNECTICUT
Division of United Aircraft Corporation

Manufactured in Canada by Canadian Pratt & Whitney Aircraft Co., Ltd., Longueuil, P. Q.; in Continental Europe by Bavarian Motor Works, Munich; in Japan by Nakajima Aircraft Works, Toki.

Wasp & Hornet Engines





Made to the most rigid specifications to stand the gaff of training and sport

Stress the student does level off high! He'll learn something—and the ship can stand it. Fairchild KR Biplanes are taking the punishment of training work day after day, and of sport flying too. Their unusual stidity to stand the gaff is due to design, and to the use of most exacting specifications that meet a large margin of strength. All welds, for instance, are in shear and not in tension. Fuselage, landing gear and other parts are of chrome molybdenum steel, which gives maximum strength where it is needed, yet holds the weight to the minimum. . . . Chink, often a vital factor in safety, distinguishes these ships, which have rates of 300 and 175 feet per minute. Ships that have to be whined out of small fields and over trees and wires have a place today.

Fairchild believes that the only justifiable thrill in flying is based on complete confidence in the ability of the plane to fit the use you make of it. . . . In spite of their unusual strength, these planes are light. The power of the engine is used not to haul a heavy structure, but to provide speed and climb, and carry the fuel, pilot and passengers. Fairchild KR Biplanes are competitive in price. It is the opinion of experienced pilots that they offer better values in construction, performance, maneuverability and completeness of equipment. A booklet giving full descriptions will be sent on request.



FAIRCHILD



KR BIPLANES

FAIRCHILD AIRPLANE MANUFACTURING CORPORATION
FAIRFORDS, LONG BEACH, NEW YORK, CHANDLER
PLANE, FARMINGDALE, N. Y.; BAYVIEW, N.J.; LONGFORD, P. Q., CANADA
Divisions of The Inland Corporation

CHASE AIRCRAFT TRAVEL FABRICS

IN competition with newer and experimental types of upholstery and trim materials, Chase products are still leaders in the field of transportation. . . . And for this there is a reason:

The Pre-eminent Upholstery Fabric

CHASE
Vetmo
MOHAIR VELVETS

combines perfect riding-luxury with last-word stylishness such as is to be found only in De Luxe vehicles of transportation . . . including passenger airplanes.

For Trim and Upholstery

CHASE
Leatherwove
SAFETY WALL, SAFETY MAT

A scientifically coated fabric—and a desirable complement to VELMO, when used as panel and door trim—or as upholstery for operators' seats. A subtly seamless fabric in a wide variety of colors and grains, giving the utmost in service at a very modest cost. Visit the Chase Exhibit at the Show.

These Chase Aircraft Travel Fabrics
Made by
SANFORD MILLS

L. C. CHASE & COMPANY, Selling Agents, BOSTON
NEW YORK • DETROIT • SAN FRANCISCO • CHICAGO



This passenger may sit in ease and comfort as parachuting with complete freedom. An Quick-Connector Air Chute instantly available in case of emergency.



Only the Quick-Connector type.

**Convenience and
Safety Combined
in the NEW ...
Quick-Connector
IRVIN AIR CHUTE**

THE Quick-Connector type of Irvin Air Chute is not worn in flight, and is neither a cushion, nor otherwise a part of an airplane chair. The chute is carried in a pack conveniently near the passenger, ready for instant use in emergency.

All the patented safety features that have brought universal recognition to the Irvin Air Chute as the standard aerial life-saving

equipment of the world, are retained in this new Quick-Connector type Irvin. It is but one of the five different types of Irvin Air Chutes, suitable to every need, and available in all parts of the country. If you do not know any dealers, write to us for address of the nearest one.

Dealers should communicate directly with the company.



The Quick-Connector type of Irvin Air Chute is not worn in flight, and is neither a cushion, nor otherwise a part of an airplane chair. It is carried in a pack conveniently near the passenger, ready for instant use in emergency.

IRVIN *The Life Preserver
of the AIR*
IRVING AIR CHUTE CO., INC., 372 PEARL STREET, BUFFALO, N. Y.



Our Western Pioneer "Happy Landings" are insured with the National Aerial Guaranty Corp. of Chicago. In addition, standard equipment is furnished in addition to the Irvin Air Chute and its accessories.

THE STRENGTH OF THE PLANE IS IN THE TUBING

Again!
at the
All-American Aircraft Show
TUBING by SUMMERILL



**will be an important
part of the Aircraft
Exhibits**

In many planes featured by prominent manufacturers Summerill Tubing is used exclusively.

Huge transports and small, fast sturdy sport and mail planes are built around the quality and workmanship of Summerill Tubing.

Be sure to visit the Summerill Tubing and Medab displays, Booths 107-115.

- (a) See model draw bench in operation.
- (b) We will show you at Detroit how seamless tubes are drawn.
- (c) See why the finish of our tubes readily meet the Aircraft specifications, by the care with which they are drawn.

Summerill Tubing Company
Bridgeport (Phila. Dist.) Pa.



In winning direction in its performance in the 50-mile Laffer Day Run for All Race at Cleveland, Ohio, in 1937, the Wright Flyer of 300 H.P. engine, proving the Travel Air "Mystery Ship" demonstrates SRB Ball Bearings for capacity and durability under these severe conditions.

SRB Ball Bearings

Sustained Every Stress and Strain of the Wright-Powered Travel Air "Mystery Ship" Record Performance....

Whether for radial loads on the crankshaft, enormous thrust loads in the propeller position or for the punishment inflicted on roller arm bearings—SRB is the overwhelming choice of the aviation engine engineer

—because SRB, size for size, gives greater load-carrying capacity and an absolutely uniform dependability.

SRB Ball Bearings lend the field in design, capacity and dependability.



STANDARD STEEL AND BEARINGS INCORPORATED
Pittsburgh DIVISION OF AMERICAN ROLLER BEARING CO. (General)

Pacific Coast Distributors
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Ball Bearings



ELGIN...AVIGO INSTRUMENTS



AVIGO COMPASS
\$50

NO DETOURS

A direct course for the pilot over land or sea is the duty of the Elgin Avigo Compass. Built to the exacting standards of three-quarters of a century of precision instrument building, this compass has met the instant approval of pilots.

The Elgin Avigo Compass meets an urgent demand for a compact, light weight, reliable compass. The base, card and compensator housing are of a new, more durable material.

The compensator is theoretically and practically correct in operation. The adjustment is positive and requires no knowledge of magnetism.

We will be pleased to furnish complete literature on the Avigo Compass or other Avigo Instruments. Just write:

Aircraft Instrument Division

ELGIN NATIONAL WATCH CO.

ELGIN



New York Office: 35 West 47th Street

West Coast Distributors: Pacific Automotive Corporation
Los Angeles, California



For Easier, Safer Night Landings

Pyle-National Prismatic
Lens Type Landing Light



Type LAMP landing light on
an S-2 mail plane.



Type LAMP II with landing
light. Prismatic lens directs the
beam forward. Beam width
adjustable horizontally and vertically.

PERFORMANCE that wins the enthusiastic approval of experienced pilots is combined with the simplest, cleanly streamlined installation in Type LANR landing lights. The clean, far-reaching beam is wide enough for full pick-up of ground detail from 700 to 1000 feet altitude. The special lens and reflector characteristics including the sharp cut-off, give a white beam without stray light. The beam is adjustable both horizontally and vertically.

Type LANR, built into the under surface of the wing, has negligible head resistance and no effect on lift or airspeed control. This landing light uses the new 12 volt, 20 ampere lamp.

Write for catalog Z10-B with full description

Pyle-National offers a complete line of airport and aircraft landing equipment. Industries around airport authorities for efficient and economical illumination. Application plans, an equipment and installation manual in most airports are procurable, with the technical data the Pyle-National engineering staff.



The Pyle-National Company

1334-1358 N. Kostner Avenue ~ Chicago, Ill., U. S. A.

4-5-31-17



WE REPEAT "IT'S A GOOD ENGINE!"

TWO years ago, in advertising the Challenger, we said "It's a good engine." That was when the Challenger was a mere youngster, before it had been flown hundreds of thousands of hours in actual service.

Since then, the Challenger has been in continuous production under exacting Curtiss standards, in the country's largest and finest aircraft engine factory. It has been given the backing of a dealer and service organization that is nation-wide. It has been installed in hundreds of sport, commercial and training aircraft and won the affectionate regard of pilots, owners, and mechanics everywhere. It has established the World's Endurance Record with an amazing 420-hour performance.

And now it has become the 1930 Challenger, with a new U. S. Department of Commerce rating of 185 horsepower. It has attained new smoothness and quietness of operation, and new lower prices that are of keen interest to manufacturers and owners alike.

We repeat—"It's a good engine."

1930
CHALLENGER

• • •
NEW
POWER
•
NEW
SMOOTHNESS
•
NEW
PRICES

CURTISS AEROPLANE & MOTOR CO., Inc.

Offices: Garden City, N. Y. • Factories: Garden City, Buffalo, N. Y.
A DIVISION OF CURTISS-WRIGHT CORPORATION

ANOTHER MANUFACTURER IN THE AVIATION INDUSTRY THAT USES SKF BEARINGS

WRIGHT AERONAUTICAL CORPORATION

44 SKF BEARINGS ON WRIGHT
WHIRLWIND FOR LOW COST SAFETY

FOR dependable, low cost air transportation to meet the demand of speeding up modern business, aviation motors must of necessity have a high degree of efficiency. Wright makes use of the reliability of their 500 H. P. J-6 Whirlwind motors by using 44 SKF Bearings on the vital locations.

It can truly be said that the hour after

hour reliability... day and night... which SKF Bearings bring to Wright motors is something not based on first cost. Ultimate performance after hundreds of hours in the air is the deciding factor. Reasoning in this manner Wright finds that "the highest priced bearing in the world", is really the cheapest.

SKF INDUSTRIES, INC., 40 East 34th Street, New York, N. Y.

289

EQUIPPED WITH THE HIGHEST PRICED BEARING IN THE WORLD

Means just this

SKF

Ball and Roller Bearings

That the manufacturers whose product is illustrated above prefer to pay more for their bearings and less for servicing or replacing them. They preferred to pay a higher price in the beginning than many times the higher price in the end. And, finally, they preferred to service by using SKF bearings because they are made to do their job, not to fix a price tag.

Those are *Elastite*
"sandwich" joints!

Shock-absorbers, built right into the concrete! Proper Carey "sandwich" joints— asphalt and fiber blends, between sheets of asphalt-saturated felt. They protect the concrete, perfectly and permanently, against expansion and contraction stresses and strains.

Airport properties everywhere are being given the lasting protection of Carey Elastite Expansion Joint. For runways and warming-up aprons, for taxi ways, sidewalks and bumper floors—to keep the concrete safely smooth. Write for particulars on Elastite joint installation.

For Aviation
Field Service:

Corrugated Asphalt Roofing and Siding, Carey Asbestos and Bitumen Mast Sealants, Carey Asbestos and Asphalt Roll-up Roofing, Carey Elastite Asphalt Flooring, Carey Elastite Asphalt Water-proofing.

Previously untested, the better take-off and landing facilities. This concrete airfield, at a large Michigan airport, is protected against expansion and contraction strains by Carey Elastite Expansion Joint.

THE PHILIP CAREY COMPANY • Lockland, CINCINNATI, OHIO

Philip
Carey
Products



Hangar for the Pan American Airways at Miami is one of numerous Robertsons projects outlined in this column.

A CONSULTING SERVICE IN

HANGAR CONSTRUCTION . . .

Robertson does have the experience . . . and aviation needs every ounce of it . . . and the world needs aviation. So there is a certain feeling of responsibility in possessing one of the world's greatest funds of experience in hangar construction. It has to be regarded as a public trust. There is no room for ordinary commercial attitudes in it.

Therefore, the Robertson Company SHARES its experience. You can call upon Robertson engineers for any information you may need about hangar designs, about the proper materials to use, about costs, about lighting arrangements, and ventilation, and doors, and a hundred other aspects of the situation.

This information is open to anyone who is genuinely interested in construction of hangars. Just write what your problem is. There will be no charge for recommendations and no obligation to you.

H. H. ROBERTSON COMPANY
PITTSBURGH, PA.



Same hangar as above, after completion.

ROBERTSON

WORLD
WIDE



HANGAR
BUILDING

EXPERIENCE

© 1939—H. H. Robertson

PROTECTION

In the earliest days of man's existence one thought was



UDYLITE is the electrolytic application of cadmium to base metals for protection against rust

Udylite

RUST PROOFS
SINCE 1906 PAT. 1911

UDYLITE PROCESS COMPANY

Sales Office
201 East 42nd St.
New York

Sales Office
1000 California Ave.
DETROIT
MICH.

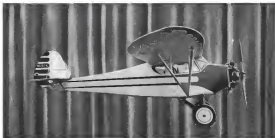
Sales Office
1045 Sutter St.
San Francisco

constantly uppermost in his mind—to protect himself—to protect his belongings.

Today manufacturing concerns must protect their products against the ravages of rust and corrosion.

UDYLITE plating is the best guarantor against rust and corrosive influences.





New Super-Performance

Under All Conditions for
The Monocoupe "90"
at \$3375.00

TAKE it point for point—a plane that is comfortable in all weather without getting dressed up to look funny. It's comfortable—you can smoke and talk, no weather too rough, one man moves it in and out the hangar, a power plant that requires less concern over motor service and maintenance than one gives his automobile, one that you can

rebuild after the second year for \$75.00—with a landing speed of less than 37 miles an hour—guaranteed top speed of 230 miles an hour and a fuel cost of less than 1½ cents a mile—an initial cost far below anything on the market, and regardless of some of the queerest yarns, some of the Jenny experts who have never flown such an airplane tell, it is so easy to fly that it's almost a shame to take money for showing a prospect how to operate it.

The unprecedented popularity of the new design necessitates your order being placed at least three weeks in advance.

Monocoupe "90" Performance

High speed	120 M.P.H.
Landing speed	37 M.P.H.
Cruising speed	130 M.P.H.
Climb	1100 ft. per min.
Hourly power	90
Length overall	34
Span	50 ft. 5 in.
Wing	22 ft. 0 in.
Cruising range	325 miles

MONO AIRCRAFT CORPORATION
MOLINE, ILLINOIS

DROP FORGINGS FOR RELIABILITY



On Chambersburg Hammers

Every airplane part that must stand up under the constant grind of repeated service is a vital part. Vital parts such as those illustrated above naturally are drop forgings, and just as naturally were forged on Chambersburg Hammers.



Chambersburg Hammers have been used in the production of forged parts for many of the most important names in the automotive industry since its very beginning. . . And in aviation, the youngest branch of that industry, Chambersburg hammers are again associated with the most important names.

CHAMBERSBURG ENGINEERING COMPANY

CHAMBERSBURG, PENNA.

SOLE AGENTS
CHAMBERSBURG-NATIONAL

COMPLETE FORGING EQUIPMENT

CHAMBERSBURG, PA. TWIN, OHIO

New York, 127 W. 42nd St. Chicago, 363 N. Washington St.

Branch, 2427 Woodward Avenue

CHAMBERSBURG HAMMERS

MEMBER OF AERONAUTICAL
CHAMBER OF COMMERCE



CURTISS-WRIGHT GROUP ADOPTS BERRYLOID AIRCRAFT FINISHES 100%

BERRY BROTHERS now fills all finishing requirements for the Curtiss-Wright group. This means that the Curtiss Aeroplane and Motor Company, Inc., Curtiss-Wright Flying Service, Curtiss Aeroplane Export Corporation, Curtiss-Robertson Airplane Manufacturing Company, Rath Aircraft Corporation, Keystone Aircraft Corporation, Travel Air Company and other associated units will use Berryloid Aircraft Finishes exclusively.

Selecting Berry Brothers in face of extreme competition Curtiss-Wright gave these points consideration:—1. Satisfaction Berryloid has given all units in the past; 2. Completeness of the Berryloid line; 3. Prompt service rendered by distributing points throughout the country; 4. Reputation and scientific research behind all Berry Brothers' finishes.

USE THE AIR MAIL AND TRAVEL BY AIR

BERRY BROTHERS, INC.
VARNISHES ENAMELS LACQUERS
DETROIT, MICHIGAN NEWARK, N.J.

PROGRESSIVE AIRCRAFT FINISHES

AVIATION
April 3, 1931

AVIATION
April 3, 1931



Bushelites used exclusively on the Travel Air two-place cabin transport



Weatherability

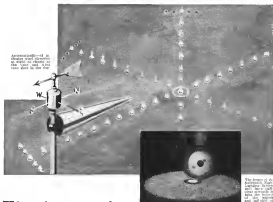
Planes flying on schedule must stand up day after day—under all conditions of moisture and temperature.

It is a tribute, therefore, to Haskelite's weatherability that it is used in a majority of the country's transport and mail planes. No other plywood has equaled the water-resistance of this blood albumin plywood. Write for engineering data.

HASKELITE
MANUFACTURING CORPORATION
120 South La Salle St., Chicago, Ill.



See the Haskelite cabinet at the Detroit Show—71 and 73 Lincolnburgh Airway



The larger of the automatic lights, known as the "Aero-C" light, is shown in the inset. It is a new type of light, and will give out a steady beam of light.

The Automatic NIGHT LIGHTING SYSTEM says: "Land into the wind *on the dotted line...*"

HAILED by outstanding figures in the aviation world—as the greatest contribution to the safety of night flying—an airport, contemplated as established, can be turned into a modern without the loss of safety this new, simple, and efficient lighting system offers.

It comprises a series of lights, or flash in the ground, one hundred feet apart on the runway. At each end are flash lights fifty feet apart in right angles to the runway. These lights are automatically dimmed by the action of the wind on the wind vane. As the wind changes the correct landing direction is automatically indicated.

This system was selected for the Green Isle Airport at Detroit, Michigan—a division of the Detroit Aeronautical Corporation—one of the largest and most modern airports in the World—after a careful consideration of all available systems? Learn more about it—write for particulars?

Advantages of the System Include:

- Indicates true ground level at all times.
- Automatic reversal.
- Indication of proper runway to land on.
- Indication of wind direction.
- Indication of runway length.
- Efficient under the most severe weather conditions.
- Shows dash of plane.
- Does not blind pilots—difficult light.
- Low operating cost.
- Obstructionless (Flash Type).

AIRPORT LIGHTING, Inc.

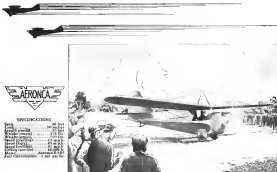
"Standard Safety Lighting Equipment for all Airports"

79 East 4th Street, New York City

Connecticut F. O. ERICSON, Inc.

EDWIN FROEDE, Inc. Inc.

Don't Fail to Inquire Our Installation at Green Isle Airport During Your Visit at the All American Aviation Show



View of field at N. A. A. Airport, 1935. One hour and aviation service in the service of aviation.

The Most Talked of Plane in America Today

THE Aero-C C-2 Two years ago this year had not even been built. Today it is making aviation history. In design the Aero-C C-2 is an innovation... a radical departure from conventional design. Instead of depending on tremendous power to pull it through the air, aerodynamic efficiency has been increased to the point where its 30 horsepower motor will make the Aero-C duplicate... and an even faster engine... the performance of planes with three times as much power. But unlike other light planes, speed and maneuverability are combined with remarkable ease of handling and absolute precision stability, regardless of weather conditions. Though a glider, the Aero-C can easily fly as Aero-C after a little instruction, the Aero-C pilot is even more confident because his experience enables him to appreciate its outstanding performance.

Even Ralph Bensen, the Navy's glider expert, declared the Aero-C to be the only and only glider because of its unique response to stick and rudder forces, its steady-state take-off and 30 mph. top landing speed, and its remarkable climb in one gliding angle.

On the other hand, such famous veteran as Frank Hawks,

Charles Chamberlain, Phil Love, Jimmy Douglas, Eleanor Smith and others expressed the most genuine enthusiasm for the Aero-C's maneuverability, its rapid climb and the unprecedented feeling of confidence they afforded... no matter what the position of the plane even when very close to the ground.

Compliments from such wide sources are, alone, a big recommendation. But to have achieved such a combination of glider safety and good plane performance in a plane which is such a low cost and one only *any* pilot can fly is an achievement that is destined to bring aviation to the thousands who could not afford to fly before.

Already more than a dozen Aero-C's have been ordered in large quantities. The Standard Company, with Major Humphrey and Colonel Brockmeyer, have sales over 50,000 units. Russell, Nicholas of Nicholas Aircraft, is busy in the Midwest and western of others are accepting large orders. Thousands of letters from all prospects, every month indicate the popular appeal and prove that the Aero-C C-2 is what the country has been waiting for—a plane which the average man can fly safely, but easily and own proudly.



AERONAUTICAL CORPORATION OF AMERICA
LUNKEN AIRPORT CINCINNATI, OHIO



Tanks and Cowlings Built to Specifications

THERE is no substitute for dependability in airplane construction. Every unit must bear its share of the loads and stresses with a margin of safety. This is the principle upon which we have built our tank and cowlings business.

Stuart tanks and cowlings have never failed because they are carefully welded of the best materials, by experienced workmen, under executive supervision and inspection.

That's why many of the largest aircraft manufacturers have specified Stuart tanks and cowlings for their finest models.

Send blue-prints for estimate.

STUART AERO PRODUCTS, Inc.

*Manufacturers Tanks, Cowlings and Motor Parts
Thirteenth and Butler Streets
ST. LOUIS, MO.*

In addition to manufacturing tanks and cowlings we make an extensive line of airplane motor parts which we offer at lower prices than the production costs of individual manufacturers.

Write for complete list and prices.



ANNOUNCING

THE CHAMBERLIN 8-SEATER

Designed by

Col. CLARENCE D. CHAMBERLIN

Built by

CRESCENT AIRCRAFT CORP.,

Jersey City, N. J.



REVOLUTIONARY— STARTLING SAFETY FEATURES

It is my conviction that this 9 pay passenger plane with a Wright Whirlwind J6 or Wasp Jr. motor is safer than a multi-engine and the plane that can make air transport profitable.

The visibility, stability and maneuverability of the Chamberlin 8-SEATER are beyond comparison. Its comfort, control and practical operating features are remarkable. Its wing has non-stalling characteristics without use of slot mechanism.

Designed from the pilot's and operator's viewpoints—engineered by experts—built by an experienced organization, it is the coardest type for transport lines as well as for sight-seeing and "taxi" service.

See it—fly it yourself! Its performance will be a distinct surprise to you.

Clarence D. Chamberlin
President

CRESCENT AIRCRAFT CORPORATION

Bergen 7318

Jersey City, N. J. 372 Lombard Ave.

Adjoining Jersey City Airport

SPECIFICATIONS

Length.....28 ft. 6 inches
Span.....44 ft. 2 inches
Weight.....4,500 lbs.
Pay Load.....1,200 lbs.
Gross Capacity.....90 gals.
Cruising Speed.....110-120 M.P.H.

Equipment

Tails and Luggage
Compartment
Brakes
Lights
Tail Wheel or Tail Skid
Manual Propeller
Stearns
Instruments and other
standard equipment

Exceptional Dealer and Distributor assistance not available with any other plane.



New Low Prices!

Inland Supersport with Warner Scarab Motor

\$4,985

Inland Sport with LeBlond "60" Motor

\$3,485

A thousand dollar price reduction on the Inland Supersport is the month's best news! Now you can own this speedy little ship for less than five thousand dollars . . . By it as economically as you can run a motor car.

Inland Sport is "tomorrow's plane today"—an airworthy ship at outstanding performance, with an American altitude record and the world's speed record for light aircraft already in its credit.

Inland Sport powered side-by-side seating to bring greater comfort and the pleasure of human companionship to open cockpit flying. Pilot and passenger sit side-by-side . . . discuss maps, controls, instruments . . . converse almost as easily as in a motor car. This arrangement is a decided advantage in training, with instructor and student seated side-by-side.

Further details gladly sent on request.



INLAND AVIATION
COMPANY

Main Field
KANSAS CITY, MO.



INLAND SPORT MONOPLANE

COMMONWEALTH PATENT CO. DAY

Manufactured at Fairfax Field under
Approved Type Certificate No. 259



Air for Airplanes

Before you purchase that air compressor for operating spray gun—for cleaning engines and planes—for tire inflation—for general shop work—be sure to consider carefully every feature of Quincy Compressors.

Here is a compressor line of 14 sizes, air cooled and water cooled, from which to select the exactly right compressor for your needs.

Quincy Compressors

are designed and built to deliver air at the lowest possible cost for power and maintenance.

They are rugged and long lived; and so quiet in operation that one is hardly aware of their presence.

Quincy Compressors are not "cheap"; they're "good."

Send the coupon for full details



Model F-2

See every one of our 14 models in our catalog. They are all built to the same high standards of quality and performance. They are all built to the same high standards of quality and performance. They are all built to the same high standards of quality and performance.



Model A

See every one of our 14 models in our catalog. They are all built to the same high standards of quality and performance. They are all built to the same high standards of quality and performance. They are all built to the same high standards of quality and performance.



Quincy Compressor Co.,
228 Maine St., Quincy, Ill.

Please send details about Quincy Compressors.

Name _____

Address _____

City _____

State _____



228 MAINE ST.
Quincy, Illinois

SERVICE AND SALES OFFICES

Atlanta, Ga.
Birmingham, Ala.
Boston, Mass.
Buffalo, N. Y.
Chicago, Ill.
Cincinnati, Ohio
Cleveland, Ohio
Dallas, Texas
Denver, Colo.

Houston, Texas
Kansas City, Mo.
Memphis, Tenn.
Milwaukee, Wis.
New York, N. Y.
New Orleans, La.
St. Louis, Mo.
Waco, Texas
Washington, D. C.

Also in other important centers

HOLD BUILDING COSTS DOWN WITH NATCO UNIBACKER



Face your airport buildings with brick, if you will—but back the walls with Natco Unibacker. You will save weight without sacrificing strength; you will save time without sacrificing durability; you will save money without sacrificing permanence.

Available in various sizes for various thicknesses of walls, Natco Unibacker every six courses, establishes a bond with the brick work, so intimate that the facing becomes an integral part of the wall. Building codes recognize the strength of this bond by permitting bearing value to be figured on full wall thickness.

Natco Unibacker, in common with all of the Natco line, offers you:

1. **FIRE SAFETY**—Natco Structural Clay Tile are absolutely noncombustible. They help smother a fire and permit a minimum of damage.
2. **ECONOMY**—The large, easily handled units are laid at visible savings in time, labor, mortar and expense.
3. **SPEEDY CONSTRUCTION**—Each Natco Tile is equivalent in volume to several bricks. Structures go up in a hurry, are quickly ready for use.
4. **PERMANENCE**—Natco Tiles are permanent in character and forms never rust, rot, or warp.
5. **LOW MAINTENANCE**—Painting, patching and repair work, necessary with most forms of construction, are not used from absolute minimum.
6. **LOW DEPRECIATION**—Buildings built of Natco Structural Clay Tile are highly resistant to destruction and decay. Depreciation is usually figured at 5% a year.
7. **DECREASED HEAT LOSS**—Natco Structural Clay Tiles have high insulating value. Dead air spaces retain heat and cold to a great degree.

NATCO
THE COMPLETE LINE OF
STRUCTURAL CLAY TILE

NATIONAL FIREPROOFING CORPORATION

1100 WEST 10TH AVENUE, DENVER, COLORADO 20
CHICAGO, ILLINOIS 18
CINCINNATI, OHIO 2
COLUMBIA, MISSISSIPPI 1
DALLAS, TEXAS 1
DETROIT, MICHIGAN 1
HOUSTON, TEXAS 1
KANSAS CITY, MISSOURI 1
LOS ANGELES, CALIFORNIA 1
MEMPHIS, TENNESSEE 1
MINNEAPOLIS, MINNESOTA 1
NEW YORK, NEW YORK 1
PHILADELPHIA, PENNSYLVANIA 1
PITTSBURGH, PENNSYLVANIA 1
ST. LOUIS, MISSOURI 1
ST. PAUL, MINNESOTA 1
SAN ANTONIO, TEXAS 1
SAN FRANCISCO, CALIFORNIA 1
SPRINGFIELD, ILLINOIS 1
TAMPA, FLORIDA 1
TULSA, OKLAHOMA 1
WASH. D.C. 1
WICHITA, KANSAS 1
WILMINGTON, DELAWARE 1

SAFETYCHUTE

THE ACE OF PARACHUTES

Every Pilot Should Own a SAFETY CHUTE

Smaller . . . Lighter . . . More Compact . . . Comfortable . . . The most modern fool-proof pack in the world today.



Get a Safety Chute for your constant flying companion. Take it with you on every flight and you can laugh at Old Man Trouble.

As comfortable to wear as your flying suit, with a one piece pack cover that is absolutely fool-proof . . . and a positive triple opening action direct from the rip—just pull the ring and the Safety Chute snaps instantly into action . . . of proven, quick opening. We have a special offer to pilots. . . . Write for information.

We Also Manufacture



Helmets • Masks • Wind Coats

Commerce Officers and Many Famous Flyers
Safety Chutes Are Used By Department of



SWITLIK PARACHUTE & EQUIPMENT CO.
TRENTON, NEW JERSEY

WE BUY A PLANE ... WHY?



EASILY does your airplane earn place was purchased and put into operation by the Greenfield Tap & Die Corporation. Our Reason: First, that a modern business can no longer afford to ignore the many practical advantages of air travel. And second, that we can manufacture better tools for the aviation industry if we have real knowledge of the industry's needs—such knowledge as can only be gained by extensive personal experience.

The Greenfield plane will be at Detroit during the latter part of the All-American Air Show. Our friends both within and without the industry will be made welcome.



NEW YORK: 18 Nassau Street
CHICAGO: 611 W. Madison St.
DETROIT: 150 Cassien St., W.
Trenton, Pa.: Greenfield Tap & Die Corp. of America, Ltd.
Tops: 1000 Park Ave. N.Y. 10001
BOSTON: 100 State St. Boston
PITTSBURGH: 100 State St. Pittsburgh
PHILADELPHIA: 100 State St. Philadelphia
SAN FRANCISCO: 100 State St. San Francisco
ST. LOUIS: 100 State St. St. Louis
WASHINGTON: 100 State St. Washington



The Lockheed REGISTER

SINCE JANUARY 1, 1930

the following distinguished persons and corporations in the United States and abroad have taken delivery of or have placed orders for new Lockheeds:

COLONEL CHARLES A. LINDERBERG	CAPTAIN JOHN A. MACCREADY Redd Oil Company of California
AMELIA BARRHART	JOHANNA FAY SHANKELE of Boston
LEUTENANT JAMES DOUGLASS Shell Petroleum Corporation	MONSIGNOR E. C. BORDOGH for the Hungarian-American Cross Flight
COLONEL ARTHUR C. GOEBEL	ASA CANNELL, JR., of Atlanta
LEUTENANT A. HAROLD BROMBERG for the Tanager Chamber of Commerce	JOHN HENRY MEARS of New York ALASKA-WASHINGTON AIRWAYS Seattle (two planes)
GUSTAF ROBERTO PERRO Director of Civil Aviation, Mexican Government	NEW YORK, RIO & BUENOS AIRES LINE, INC. (two planes)

DETROIT AIRCRAFT

FOOT AND CAMPAU STREETS, DETROIT

THURSDAY, APRIL 3, 1933 - ROOSEVELT BUILDING, LOS ANGELES

USCOED AIRCRAFT CORPORATION	BLACKBURN AIRCRAFT CORPORATION
SEAFARM AIRCRAFT CORPORATION	AIRBART DEVELOPMENT CORPORATION
SEAN AIRCRAFT CORPORATION	MAIRIAIRCRAFT CORPORATION
AIRBART DEVELOPMENT CORPORATION	GRAND LEE AIRPORT, INCORPORATED
PARIS AIRCRAFT CORPORATION	DETROIT AIRCRAFT EXHIBIT CO.





Dependable Speed Indication



Model 544 Magnet

WATCHING the performance of aircraft engines by listening to their roar, or noting their speed on indicators located outside the cockpit, is an unwarranted distraction for the pilot.

It is now possible by means of a recent Weston development for the pilot to note the speed of engines instantly, easily and with electrical certainty by the simple expedient of watching an indicator mounted on the instrument panel.

The instrument which Weston offers for this service is known as Model 544 Electric Tachometer.

The principle is not new. It has been applied with marked success for many years in Weston

Tachometers for speed measurements in laboratories, industry and railway and marine fields.

The Model 544 is now in daily service on many passenger and mail planes. It is contributing a most important service by giving timely warning of fluctuations in engine speeds, helping to insure flight safety and providing another scientific unit for efficient complete and positive instrument flying control.

The Model 544 is a small refined generator connected directly into the Tachometer coupling on the engine. The voltage generated is transmitted by cables to an indicator, sealed to read in R. P. M. located on the instrument panel. It is easy to install and requires practically no lubrication or attention of any kind.

For complete details write for D. S. 544

WESTON ELECTRICAL INSTRUMENT CORPORATION,
416 Folsom Avenue, Newark, N. J.



Model 201 Indicator
Black dial and
luminous markings
and pointers.



Model 201 Indicator,
with black dial and
luminous markings and
pointers, accurate indicator.



They used to read reports

THE directors of Central Interstate Utilities, Inc., faced a difficult, but not uncommon problem. Their seventeen operating properties lay scattered through eleven states—seventeen colored markers on a map. Diversification? Yes. Close personal supervision? Well, hardly.

Then the company bought a Travel Air Supervision because an accuracy. These, sometimes less properties can now be visited in a single day. The entire holdings of the company can easily be inspected by the directors in a week. They used to read reports. Now they make them.

The Travel Air six passenger cabin monoplane is constantly fitted to the requirements of flying executives and directors. In addition to inspection trips, it can be put to many uses in any business. Handily equipped, powered with the 300 h.p. Wright Whirlwind engine, it gives speed, prestige and privacy to urgent missions. Cranking at a speed of almost two

miles a minute, the Travel Air monoplane has a range of 400 miles. Another model, powered with a 420 h.p. engine, has even higher speed and longer range.

Owners of Travel Air planes have the further advantage of always being within easy reach of the nation-wide organization of Curtiss-Wright distributors and airports whose necessary parts and repairs may be had by Curtiss-Wright trained mechanics.

Planes in business. Travel Air has equipped so many progressive concerns with these luxurious planes that it can supply reliable data on the low operating cost and on the business economies which have been effected. For full information, write Department T-71.

TRAVEL AIR COMPANY
Division of CURTISS-WRIGHT
27 West 57th Street • New York

TRAVEL AIR
A PLANE FOR EVERY PURPOSE

This is one of a series of advertisements directed originally to advertising men in an effort to make industrial advertising more profitable to buyer and seller. It is printed in these pages as an inducement to readers that McGraw-Hill publishing standards mean advertising effectiveness as well as editorial quality.

Squelching another whispering campaign—



"Look out for that company, it's slipping," said the whisperers. Its product, an assembled unit sold to manufacturers to build into their machines, was of high quality but had been sold only through salesmen and direct mail.

Sales were falling off. The market, conscious of the gossip, was suspicious of the financial strength of the seller. This increasing sales resistance was undermining the morale of the sales staff.

With this serious situation facing it, the company called in an advertising agent who recommended an emergency advertising campaign in a McGraw-Hill publication covering the particular market. The program, the first publication advertising ever used by this company, consisted of color spreads in every issue.

That was only a year ago. Today, as evidence of the company's comeback, sales are not only mounting but the advertiser's chief competitor has offered to sell out to the new advertiser. From bottom place to top position is recognition in one year.

MORAL: Selling is not a chance between salesmen, publication advertising and direct mail but a matter of co-ordinating all three and using each on a basis of the job to be done.

McGraw-Hill PUBLICATIONS

New York Chicago Cleveland Denver Philadelphia St. Louis
Greenfield San Francisco Boston London

MOTO METER AVIATION INSTRUMENTS



This 36" of diameter and automatic aneroid bar element have made wide favor in engine driven aircraft. Their working instruments show their quality, rugged heavy base, chrome plate and spring in operation, automatic figure with an L-shaped float and characteristic of their sound working quality.

ALL PURPOSE
\$14.00
Model 7991 & 7992

PER PRESSURE
\$14.00
Model 7991 & 7992



Another Danger Loses its Terror

ICE on the wing! A danger as plain like to contemplate. The unexpected condition changed wing contour means less lift, the possibility of a stall and a forced landing. Schedules are disrupted, profits reduced.

There is no positive means of preventing the formation of ice on the wing with ice on the wing and the ice is the danger zone.

To do that it is necessary to have an instrument that will give warning when the temperature falls to the critical point which is a measured temperature minus condensation. For this purpose the Moto Meter Ice Warning Indicator has been developed.

This sturdy, efficient instrument tells you at a glance the results of supercooling—information that is doubly important in critical climb jobs. It is accurate and reliable in the extremes, it covers and handles all the Moto Meter Corporation can make it—while it keeps going & fit.

MOTO METER

GAUGE & EQUIPMENT CORPORATION

LONG ISLAND CITY, N.Y. 11101, N.Y.

NEW YORK, U.S.A. 10036, N.Y.

Representatives at Long Island City, N.Y. • Chicago • Los Angeles • London • Paris • Rome • Toronto • Washington



THE MEN SHOWN ABOVE (FROM SIX STATES) PURCHASED
ARROWS AND LEARNED TO FLY—FREE

ARROW
SPORT "50"
60 H.P. LeRhoad
\$3133.00

ARROW
SPORT "50"
50 H.P. LeRhoad
\$3333.00

ARROW
TANGHERINE
50 H.P. Lambert
\$3333.00

ARROW
PURSUIT
200 H.P. KENNER
\$3995.00

AN opportunity of a lifetime—free flying instruction! America's leading manufacturer of training and sport planes, together with direct factory representation, offer **FREE FLYING INSTRUCTION** with the purchase of an Arrow. Not just dual instruction—but a complete Private License Pilot Course with training under the supervision of flight instructors.

The Arrow is everything you can ask of a training plane. Safe—the probable—most useful—standard—sturdy—flying speed—satisfying stimulus. Side by side seating arrangement makes for easy training. Reliance of performance is outstanding.

Every company shown on the list at the right employs only experienced accredited instructors. Jump on the "band wagon"—make up your mind to accept this unprecedented offer. Write still—write or wire direct to the factory and get more information. Don't put it off—write at once—today.

Your flying school can make you money! Let us show you how to do it. Write for full details of a positive profit making service. We'll show how your school can be placed in the big money making class.



ARROW AIRCRAFT AND MOTORS CORPORATION
Beverly, Nebraska

Arrow Instruction Table

Arrow Sport "50", 60 H.P. LeRhoad	Arrow Sport "50", 50 H.P. LeRhoad	Arrow Tangherine, 50 H.P. Lambert	Arrow Pursuit, 200 H.P. Kenner
Arrow Sport "50", 60 H.P. LeRhoad	Arrow Sport "50", 50 H.P. LeRhoad	Arrow Tangherine, 50 H.P. Lambert	Arrow Pursuit, 200 H.P. Kenner
Arrow Sport "50", 60 H.P. LeRhoad	Arrow Sport "50", 50 H.P. LeRhoad	Arrow Tangherine, 50 H.P. Lambert	Arrow Pursuit, 200 H.P. Kenner
Arrow Sport "50", 60 H.P. LeRhoad	Arrow Sport "50", 50 H.P. LeRhoad	Arrow Tangherine, 50 H.P. Lambert	Arrow Pursuit, 200 H.P. Kenner

Quick and Sure with only half the shock

Decide how much
your life is worth.
Compare this price
with the price of a
parachute. If your
life is worth the
cost—get a para-
chute.

If not—don't!

Other advantages of the Hoffman Triangle Para-
chute are:

(1) Remarkably low shock on opening. This type
has been recognized in standardization tests.
Less than half the shock experienced in most
other types makes life after opening of the
parachute easier.

(2) Proves several simple checks for use done
made with 1100 pounds of load. Each opening
has been made possible by the new method of
parachute construction and the use of the new
method of attaching suspension lines to double the full
strength of the line and allow adjustment of full
at any angle.

(3) Low rate of descent has been achieved
through wind tunnel experiment which proves
that the Triangle chute is more regular than
most other types made in the field. It has been
been proven that it has a average 30 ft. per
second descent rate. Landing up landing has not
at all common.

(4) The lack of oscillation definitely decreases the danger of landing a
parachute on rough ground by landing when swinging in a circle.

(5) The Triangle Chute design makes every angle the tail over the right
shoulder and can be turned to right or left by pulling on the outer line or
the left shoulder. A man can turn head backwards with the suspension.

(6) The suspension and frame arrangement design are the only suspension
type in the world which is so designed that it can be opened with
only a single hand.

(7) The leaves and pack arrangement is quite more comfortable in both
in landing and during descent than that found in other chutes.

(8) Of these advantages were specially developed by E. L. Hoffman and
cannot be described. Many quality conditions are shown before they are
open to the public. We shall be glad to send you the last number of the
book for when you are a purchaser and why. E. L. Hoffman, Chief
Designer of the new and improved model of the Triangle parachute.

Patent on all features of the Triangle parachute is in United States and Foreign countries.
Copy no longer than that of the ordinary chute for the time in the world
in use.

ASK ABOUT OUR EASY PAYMENT PLAN.

Complete equipped service department for all types of chutes. The patented
Triangle system, fastenings, pack, pilot chute and quick attachment methods
shown applied in other chutes at factory. — Chutes tested by day or week

A new and better airplane SAFETY BELT designed by E. L. Hoffman is now available.
Absolutely secure in use, yet quickly and easily released—much lighter and softer in ad-
just. Worn on when suspended in falls. It is always out of the way when working or
during the jump.

The TRIANGLE PARACHUTE CO.
1200 WERNICK BUILDING, CINCINNATI, OHIO

Ten years of intensive development work by E. L. Hoffman, recognized world authority on parachutes, has made possible the remarkable action shown in the motion picture film advertisement on this page. The actual elapsed time between the top and bottom photographs is one and one twelfth seconds. But— even more remarkable—is the fact that this almost instantaneous opening action has been attained with less than half the shock to the jumper. Chief among the causes of this quick opening action is a entirely new design of pilot chute which weighs less and pulls more than any other type of pilot chute in use. A new method of ejection throws it five feet clear of the pack, independent of the force of pull on the rip cord.

An advanced design of pack and pack release method which increases to the speed of opening. The suspension line system allows the lines to come on easily at any angle of pull yet hold them in so they may pull out in the proper order. Figure 2 shows the action of the specially designed shroud line system. This arrangement insures proper opening of the canopy so that the air stream can get into the mesh of the chute and fill it quickly. This prevents the chute from coming out of the pack in a fold, causing delayed opening or finding out to disadvantage of the jumper from such a collapse.

The construction and shape of the canopy leaves part of the shroud line on each the air port where the pilot chute is pulling back against the load as opening. An unprecedented canopy design opens and stays open and stays open and stays open.

POSITIVE PROTECTION ... FROM FIRE

for THE NEW DETROIT MUNICIPAL HANGAR



(Whittelsey Deluge)

IN THE new Detroit Municipal Hangar, complete protection from fire is assured by the installation of the Hangar Deluge System—a modern system specifically designed to combat fires in airplane hangars.

When you attend the Detroit Aviation Show at the Municipal Hangar, look for the red sprinkler pipes at the ceiling, and the sprinklers in the floor. Notice, too, the batteries of "Automatic" Deluge Valves along the center columns of the hangar. These sixty-four Deluge Valves operate independently—each controlling one section of the hangar. Should fire break out in any one area, that section will be instantly deluged with water from open sprinklers above and below—extinguishing the fire.

If you see displaying any of your planes or equipment in the Detroit Municipal Hangar, remember that the Hangar Deluge System is keeping silent, alert watch, ready to go into instant action if a fire starts.

Write for Bulletin No. 38—The Answer to Fire-Capital Problems in Airplane Hangars, which gives you complete information on the Hangar Deluge System.

THE HANGAR DELUGE SYSTEM

OF OVERHEAD AND UNDERFLOOR SPRINKLERS

"Automatic" Sprinkler Corporation of America

Executive offices, Cleveland, Ohio

Offices in principal cities



(Whittelsey Avian)

PAY AS YOU FLY... in the world's most dependable light plane

WHITTELSEY AVIAN

WHITTELSEY AVIAN...	\$3845
DOWN PAYMENT.....	\$1358
Balance Monthly Payments	
HANDLEY PAGE WING SLOTS	
	\$450

All prices F. O. B. Dayton, Ohio.

MANY thousands, who have never before been able to consider the purchase of a plane can now take up flying with a Whittelsey Avian. The price is down to only \$3845. First payment is but \$1358, and balance can be written off in easy monthly installments.

Quantity production has made this possible—quantity production and a plane that has been perfected and proved in every detail.

The Avian embodies all the latest safety features. Handley Page Wing Slots add 50 extra, which eliminate danger of spins and permit slower landing speed! In the air the Avian's stability is phenomenal.

This plane can be operated economically for business or personal use and at the training school. 20 miles of travel for every gallon of gas in the Avian!

Pilots say that our plane is "safest to fly—easiest to land." Write now for complete details of the Avian—and the convenient purchase plan.



When you fly — and the Whittelsey Avian you have everything to talk about. The Avian will give you such a record of performance, on the equipment. Select your distributor now and bring application. Write for our sales plan and the full data and specification of the Avian (Self). The Whittelsey Manufacturing Company, 333 Howard Avenue, Dayton, Ohio.



WHITTELSEY

AVIAN

THE OUTSTANDING SPORT AND TRAINING PLANE OF THE WORLD